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# The Status of Biology Teaching and Learning in Higher Secondary Schools of Madhya Pradesh

A dissertation submitted to Bhopal University, Bhopal
in part fulfilment of the requirements
of M. Ed Examination, 1974.

By

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# C E R T I F I C A T E

Certified that Kumari Maya Devi Shukla has worked under my guidance. Her dissertation "The Status of Biology Teaching and Learning in Higher Secondary School of Madhya Pradesh" is worthy of presentation in part fulfilment of the requirements of the degree of M.Ed. Part II Examination, 1974 of the Bhopal University, Bhopal.

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(Km. Maya D. Shukla)
M.Ed. student

# CHAPTER I

## INTRODUCTION

**The Problem :** There is a large gap between the standard of living in India and that of Industrially developed countries of the world. The first scientific industrial revolution which developed in the West, over the last 200 years almost passed us by. The Argo-industrial revolution which is even more crucial for us has yet to begin in our country despite Atomic explosion on 18.5.1974. The world is now at the beginning of the second scientific industrial revolution of automation and cybernetics which is likely to be in full swing before the close of the century. It is difficult to visualize the changes that it will make in man's life. And it is very certain that unless proper steps are taken right from now, the gap between us and the industrialized countries following this second revolution may become too wide to be bridged. Knowledge is international and there can be no barrier for its impart. But how long can we remain at the receiving end of the pipeline ? We must also make some contribution towards intellectual and cultural equal to eternal human endeavour. This requires programme for the discovery and development of talent. The difficulty in this is that India is a multi-party system of Democratic country, which contains multi-religions mixed society of highly sophisticated people who lived side by side with primitive ones;

its economy is also mixed on one hand with modern factories and on the other hand with praditional agriculture and in addition its multiplicity of languages presents a complex structure which almost resembles "a miniature world".

The realization of the country's aspirations involves changes in the knowledge, skills, interest and values of the people as a whole. This is basic to every programme of India, which stands in need. For example there can be no hope of making the country self-sufficient in food unless the farmer himself is moved out of his age long conservatism though a science-based education, interested in education and ready to adopt techniques that increase yields. To bring out the change, only one instrument can bring about this change and that is science education. It is difficult and its effective use requires strength and will, dedicated work and sacrifice. It is sure and tried instrument, which has been tried by other countries of the world. National development and its prosperity is possible only when the national system of education is properly organised from both qualitative and quantitative point of view.

The national system of education needs a radical change in all aspects to meet the purposes of a modernizing democratic and socialistic society in objectives, in content, in teaching methods, in programmes, in the size & compasition

of the student body in the selection and professional preparation of the teachers, in organisation etc. The educational revolution has three main objects :

i) Interval transformation so as to relate it to the life, needs and aspirations of nation.

ii) Qualitative improvement, so that the standards achieved are adequate and keep continually rising.

iii) Expansion of educational facilities broadly on the basis of man power, needs and with an accent on equalization of educational opportunities.

There is a direct relation between the education and the productivity of nation, so that an expansion of education leads to an increase in national income which may provide the large investment in education. The link between productivity and the education can be built in by the reconstruction of education plans.

Science education is the base for Technology and Industrial development which helps in modernization of agriculture and development of industries. In traditional society production was largely the result of trial and error rather than on science, but in modern society it is basically rooted in science.

We are now at the crucial stage in the process of development and transformation, for which science is the most important.

Science education must become an integral part of school education. The quality of science teaching has also to be raised considerably, so as to achieve its proper objectives and purpose namely to promote deep understanding of the basic principles, to develop problem solving, analytical skills and ability to apply them to the problems of daily life. Only then can a scientific outlook become part of our way of life and culture. Science also strengthen the commitment of man to free enquiry and to the quest for truth as his earnest duty.

In the modern age science should serve as a good vehicle for education and also should assure that it gives knowledge of facts. "Students should know what they are doing and where they are going and must also know something of where they have come from and how they have travelled". It is always insisted that students should learn 'science' and not the history of science as is seen in every school. The science of today should be objective and not subjective.

"With each new generation our fund of scientific knowledge increases five folds".

In the recent years on account of technological and scientific researches, the knowledge has been growing

at a rapid pace and the state of progress has been so staggering that science teachers have been facing many complex problems in the teaching of science. Many accepted theories are becoming obsolete and many famous theories are undergoing changes. The gap between what we are teaching and what is actually happening in the field of science is becoming bigger and bigger. No person can have a mastery over any branch of a single science and the modern trend is towards specialization. If the study of science is to develop beyond a knowledge of facts, it is important to know what else is that which it can prove.

Leadership in scientific progress depends upon sound educational system of science. We have to reconstruct our science curriculum, reorient our mode of teaching of science in keeping with the modern advancements of science and technology and have a very good science programme. Practically all branches of science now rely upon the properties of concluded realities not apparent to senses directly but also open to experimental details. And any thoughtful student can think to what degree it is reasonable and correct. It is essential for a teacher to encourage and be prepared for the open discussion in the class. This will not be possible unless the teacher and his students are well equipped with theory of knowledge. The teacher should be equipped with it at the outset in order so that his students may gain some of it in the course of their studies.

In schools we teach the theory of evolution, or atomic theory as a matter of fact. Now a days children come to school knowing much about it as they read or listen about it before they come to school. So we have to re-construct our science curriculum, re-orient our mode of teaching of science in keeping with the modern advancement and have a very good science programme.

Science programme, built by us must be on the basis of a close co-ordination between school science programme and college science programme. In United States of America all the school teachers, scientists and university professors were brought together to find out weak spots in their science programme in 1960. They took into consideration the resources, vast population of students, scarcity of qualified and competent teachers and the techniques they had to employ in order to teach science by doing. Good science programme dispels superstitions, but science taught badly makes a negative contribution towards education. If science has to be taught well, it must have experimental approach.

Dr. D.S. Kothari, the Chairman of the University Grants Commission addressing a conference of the education Secretaries in June 1963 has also pointed out that "If Science is done badly, it is worse than useless. Science taught badly not only degenerates into superstitions, but makes a negative

contribution to education. To learn science is to do science. There is no other way of learning science. This leads us to experimental method. This must be learnt at the beginning of the study of science, even at the school stage".

The nature & structure of science can be compared with the frame work of a building under construction. A framework has vertical pillars. The pillars are interlaced with horizontal beams. The upper beams serve as a platform on which the builders use the tools of their trade to extend the frame work. This frame work is built on a solid foundation firmly rooted in the underlying earth. Similarly the science taught in High School, if it is baseless or foundation of it is not strong in the middle classes, it will never be sound. Thus the percentage of failure in Board examination is very high. No one seems to bother to look into the matter, why the students fail ? What are the root causes? Whatever the courses may be, the main cause of failure can be the defective approach in science teaching.

As the methods of science are becoming more and more refined and spphisticated it becomes harder and harder but more important for the teacher to explain the methods and the outcomes of these results to students and public at large. With the rapid expansion and development of science it has become more important that students of

one school should gain some understanding of the nature and structure of science. To this our approaches to teaching must be consistent with the nature of science. The methods and the approaches of science are among the most powerful intellectual tools; man has developed and is especially important characteristic of science.

Science Teaching in India acquired a distinct status at the school stage only after the independence. In this context Secondary School Commission's Report suggested special provisions to be made in the various Five Year Plans; establishment of NCERT and State Institutes of Science education. In this connection Kothari Commission's Report needs special mention. But still it can be safely said that the provision of science education is not the same through out the country. (Wanchoo & Vaidya).

Even within the same State the position of Science Teaching is not the same ∅ if one considers the type of schools(Central; NCERT, Board, State Govt. and Private rural & urban). The availability of teachers (PGT, TGT and Trained and untrained, male and Female Teachers) and laboratory facilities are the outside variables which influence science teaching firmly in any State. The problem becomes bit more serious, where in our day to day Science teaching, we hardly take into consideration, science students reactions, not only to the various sciences but also their individual preferences. Apart

Apart from the diploma, what do they want to get out of learning science subjects. The present study, therefore, attempts to study part of these problems with special reference to the status of teaching and learning Biology in Higher Secondary Schools of Madhya Pradesh.

Biology which is the science of living things has been very badly neglected at the school level. Majority thinks that it is a subject which can be taught by any Tom Dick & Harry, with or without the adequate qualifications. This needs a careful study to see the status of Biology in our schools.

Biology is also an essential ingradient of scientific knowledge which is essential for a national existence in the modern world. Interest in the world of nature is a part of the make up of every child, and if fostered in school can remain through out life and add greatly to the joy of living.

The Biological sciences can offer an interest kxx in natural phenomenon at a level that all can appreciate and can lead to an understanding of how man fits into the pattern of nature.

Like Physics, biology also contains some of the most far reaching generalizations which have profoundly altered the thinking of the Humana-race. The two great generalizations in the biological sciences came some two hundred years after the start was made in physical science.

These two generalizations are theories of evolution and genetics. No one can go through life without making contact with the theory of evolution.

An important result of the teaching of biology should be an understanding of the working of the human body, and how to maintain it in a state of health. This can only be achieved only through the knowledge of the principles of biological study. Like physical science, there is an important, technical side to biological study also i.e. Agriculture and Horticulture. Particularly under the crucial conditions in our country there is an increasing need of imparting scientific knowledge. There is also of course, the technical application of Biology to human and animal medicines. Last but not the least, parallel to the problem of mans use of nergy in physics, there is in biology too, a similar and even more difficult problem and one of even greater importance namely that of food supplies and population increase. The population of the world is increasing at such an alarming rate that there is no prospect of food supplies being able to keep pace with it unless the growth in population can be checked, the world is heading towards disaster. There are many who consider this to be the greatest problem which at present confronts the human race, not excluding that of the nuclear-explosive. Only Biology offers an opportunity for it to be studied.

In view of every thing stated above it is very essential that the standard of teaching and learning of biology is considerably raised in our schools. This can not be achieved if suggestions are thrown in a vacuum like a politician or a public man. A research worker can not suggest ways and means unless existing conditions are presented in a crystal clear manner. This study is a modest effort in this direction.

# CHAPTER II

## The Study

The present study attempts to find out the state of affairs in the area of Biology teaching and learning in secondary schools of Madhya Pradesh.

### I. The Aims & Objectives of this Study :

This study aims to attain the following :

1. To find out why students take up Biology at Higher Secondary stage ?
2. Who motivate or advice them to take Biology as an optional subject at Higher Secondary stage ?
3. What are the opinions of students and teachers on the existing syllabus & curriculum and what improvements do they suggest ?
4. What is the condition of the laboratories with regard to the availability of space and equipment and the essential equipment need for effective functioning of the science department ?
5. How is the practical work organized in the laboratories for IX, X & XI classes ?
6. What are the reasons of failure in Biology ?
7. What are the practical difficulties faced by the students while doing practicals in the Biology laboratory ?
8. What are the areas of special interest in students and teachers for their higher education ?

9. What are the individual differences amongst science teachers with reference to their age, qualifications - academic and professional ; teaching experiences, teaching of subsidiary subjects and special interest and hobbies ?

10. What are the approaches to Biology teaching and how the individual differences are met.

11. What is the position in respect of school library; the allocation of funds, instructional and illustrative material, work load of science teacher, internal assessment & evaluation etc. ?

12. What are the personal and professional problems of Biology teachers ? What difficulties do they encounter in teaching ? What suggestions do they make for effective Biology teaching at Higher Secondary school level ?

II. Procedure :

To obtain the information two questionnaires were developed, one for biology teachers and the other for students who have taken Biology as an optional subject at the Higher Secondary stage. The questionnaires were prepared on the basis of the experience and observation of Biology students in the class. A pilot study was, then undertaken with a view to minimise ambiguities and improve the questionnaires before sending them to the schools.

No special instructions were given as the questions were self explanatory. The students and the teachers were requested to give their free and candid opinion which it was promised would be kept confidential.

III. Sample :

To get the information of Biology students studying in XI class, the five types of schools were taken under study. These schools were categorized as 'A' for convent school(private), B1 for Central School, B2 for Demonstration Multipurpose Higher Secondary School attached to RCE, C1 for Govt. Girls Higher Secondary School, and C2 for Govt. Boys Higher Secondary School of Bhopal.

Table No.1

Table showing the schools and students taken as sample for the study.

| S.No. | Type of School | No.of students | Categories |
|---|---|---|---|
| 1. | Convent | 50 | 'A' |
| 2. | Central | 40 | 'B1' |
| 3. | Demonstration | 30 | 'B2' |
| 4. | Govt. Girls | 50 | 'C1' |
| 5. | Govt. Boys | 50 | 'C2' |
| | N = 5 | N = 220 | |

All the schools under study taught all branches of science namely physics, chemistry and Biology. The number of students available in the schools were 50 in convent school, 40 in central school, 30 in Demonstration School, 50 in Govt. Girls Higher Secondary School, and 50 in Govt. boys Higher Secondary School. The students responses to these questionnaires were encouraging contrary to our original assumptions. The reason for this could be that the questionnaires were personally taken to these schools and got filled in by the students.

b) Teachers

For the administration of questionnaires meant for Biology teachers, there was no restriction in regards to the type of school. The questionnaires were sent by post to all the Biology teachers of different schools irrespective of whether they were private, central govt.or State Govt. schools. As compared to the responses of the students the number of responses from teachers were not very encouraging. In spite of repeated reminders and personal requests only twenty five questionnaires duly filled in were collected. The reasons for this can be manyfold. 1) Detailed and lengthy questionnaire (2) The items required a lot of information and thinking on the part of the respondents especially the open ended questions. (3) The number of biology teachers is less as compared to other science subjects. Of these twenty five teachers twelve were male teachers and thirteen were female teachers. Twelve were

trained post graduate, three were trained graduates in Biological Science, one post graduate in science and Education, one post graduate & trained in science as well as Arts. Five were post graduates in Biological science but not trained and one post graduate in Chemistry, one graduate with L.T.(Licence in Teaching). The table of which is given below :

Table No.2

| Qualifi-cations | M.Sc. (Chem.) | M.Sc. B.Ed. | M.Sc. | B.Sc. B.Ed. | B.Sc. L.T. | M.Sc. M.Ed. | M.A. B.Sc. B.Ed. | M.Sc. M.A. B.Ed. | To ta l |
|---|---|---|---|---|---|---|---|---|---|
| No.of Teachers | 1 | 12 | 5 | 3 | 1 | 1 | 1 | 1 | 25 |

Their ages varies and ranges from 25 years to 45 years . About 48 p.c. of them were of 25 to 30 years of age. 32 p.c. were of 31-35 years, 12 p.c. were of 36-40 years of age, and only 8 p.c. were of ages 41-45 years of age. Their teaching experience varied quite widely from under a year to thirty three years. About 28 p.c. were fresh and had experience from under one year to five years, 44 p.c. had experience from 6 years to 10 years and 16 p.c. had experience of 11 to 15 years and 12 p.c. had experience of 16-20 years. This shows that Biology has very recently been introduced in the Higher secondary schools.

Table No.3

Table showing age and experience of teachers included in the study.

| Age group | 25-30 | 31-35 | 36-40 | 41-45 | 46-50 | Total |
|---|---|---|---|---|---|---|
| No.of Teachers | 12 | 8 | 3 | 2 | x | 25 |

| Experience in years | 1-5 | 6-10 | 11-15 | 16-20 | 21-25 | Total |
|---|---|---|---|---|---|---|
| No.of Teachers | 7 | 11 | 4 | 3 | x | 25 |

In addition to biology these teachers were teaching other subjects like chemistry (N=12); General Science(N=10); Physics(N=2); Ele. Biology(N=2); Mathematics(N=2), Craft(N=1); Moral Science (N=1); Home Science(N=1); Handwriting(N=1).

IV. Description of the Questionnaires :

a) The students questionnaire :

The questionnaire meant for Biology students contained two parts. One part contained 10 open-ended questions, seeking their personal opinions and suggestions, the other part contained 25 statements. The statements were given and the students had to give their immediate reactions without thinking too much on any one statement. If they agreed they had to write 'A' in front of the statement, if they disagreed they had to write "D" and if they were not able to decide or were confused they had to put question mark (?) in front of the statement.

The areas covered by the students' questionnaire were Reasons for taking up Bilogy at higher secondary stage; who had motivated them to take up Biology as an optional subject at Higher Secondary stage; will they be able to study biology without taking help from the teachers; Topics of their interest; topics which are to be deleted from course(suitability of the syllabus and suggestions for its modification), causes of failure in biological science; difficulties faced by students during the practicals; areas of interest in Biology for higher studies & suggestions for making Biology an interesting and stimulating subject. The statements covered the areas of Biology as seen by the students, laboratory work, Biology syllabus, Medium of Instructional etc.

b) <u>The Teachers questionnaire</u> :

THE questionnaire meant for Biology Teachers contained questions which contained questions requiring factual information and the other open ended seeking their personal opinions and suggestions. The areas covered were (i) aims and objectives of Biology teaching (both theory and practical) and the extent to which they were realized; (ii) difficulties encountered in teaching Biological sience (iii) suitablity of the curriculum and suggestions for modifications if any (iv) the biology laboratory (v) the provision for instructional and illustrative material (vi) causes of failure in Biology subject (vii) effectiveness of internal assessment,(viii) the school library and

(ix) other professional problems of Biology Teachers.

V. The Questions posed :

The following questions were posed and Biology teachers were requested to answer them as completely as possible:

1. What are the aims and objectives of teaching Biology theory & practicals at higher secondary stage and upto what extent are they realized ?
3. What are approaches to Science teaching and how are individual differences met ?
4. What are their opinions on the existing syllabus and curriculum and what improvements do they suggest ?
4. What are the individual differences amongst science teachers with reference to their age, qualification - academic and profesional, teaching experience, teaching of subsidiary subjects and special interest in hobbies ?
5. How practical work is organized in the laboratories for IX, X, & XI classes ?
6. What is the condition of the laboratories with regard to the availability of space and equipment and the essential equipment needed for effective functioning of the science department ?
7. ~~What~~ Why are the students unsuccessful in securing pass marks in the examinations ?

8. What is the opinion in respect of school library, the allocation of funds, instructional and illustrative material, work load of science teachers, internal assessment etc.
9. What are the personal and professional problem of Biology teachers ? What difficulties do they encounter in teaching ? What suggestions do they make for effective biology teaching at higher secondary stage ?

VI. Handling of the Responses :

All the responses, except those which were considered irrelevant, vague, mixed and hence difficult to classify, were tabulated, categorized and interpreted. Every care was taken to count each response, though it was very difficult to tabulate all the responses received through open ended questions which attracted large number of responses. The questions related to particular area of Teaching of Biology were grouped together to facilitate interpretations, of the data. It may be further mentioned that the quality of responses received has also been given due consideration, and therefore, a quality response given only be one of the respondant has also been included.

VII. Limitations of this study:

This study has following limitations :

1. It surveys the status of learning and teaching of the biology subject only.

2. Only the students of urban schools have been included in the study and that too from two important cities of M.P.

3. The opinions of only 220 boys and 25 teachers have been included in this study.

VIII. Organisation of the report

The present study has been organised under the following chapters :

I - The first chapter is introductory in nature and gives the need and purpose of the study.

II - The second chapter describes the sample schools, teachers and student population included in the study; description of questionnaires and limitations of the study;

III - The Third Chapter deals with findings and discussions.

IV - The fourth chapter includes summary, conclusions and recommendations.

# CHAPTER III

## DISCUSSIONS AND FINDINGS

The main findings of this study are discussed under the following heads :

1. Reasons why students offer Biology.
2. Who motivates them to offer Biology
3. Whether teachers help is needed to learn biology
4. Aims and objectives of Biology teaching and practicals
5. Aspects of Laboratory work
6. Biology curriculum
7. Causes of Failure in Biology
8. Creating Scientific Interest
9. Evaluation and Internal Assessment
10. School Library
11. Measures to help gifted, Average & Slow learners
12. Problems of Teachers and Professional Growth.
13. Academic Growth
14. Approaches to Teaching & the use of Teaching Aids
15. Reactions of students to the 25 statements posed at the end of questionnaire
16. Some suggestions for improvement of Biology Teaching.

The analysis of replies are discussed in the pages to follow.

I. Reasons why students offer biology

Following reasons have emerged from students replies why they offer biology as an optional subject at Higher Secondary stage. One student was allowed to give several reasons :

| | F | p.c. |
|---|---|---|
| 1. Interested and liking for the subject | 189 | 85.9 |
| 2. To take up medical profession | 186 | 84.54 |
| 3. To know about living things & nature | 104 | 47.27 |
| 4. To make it as a carrier subject | 58 | 26.36 |
| 5. To serve mankind | 57 | 25.9 |
| 6. To know the human phenomenon | 44 | 20.00 |
| 7. The choice is forced | 41 | 18.6 |
| 8. To get good service | 24 | 10.9 |
| 9. Interested in practicals | 16 | 7.27 |
| 10. Can secure good marks | 13 | 5.9 |

The data shows that 85.9 p.c. of students were interested in the subject from the beginning and had liking also for it. It is observed that 84.54 p.c. of students were motivated to pursue biological course of study as they would succeed in Medical profession. About 47.27 p.c. of the students have curiosity and anxiety to ascertain the truth and discover living things and nature. 26.36 p.c. of the students wished to make biology as a carrier subject and 25.9 p.c. wished to make significant contribution to the field of science, by serving mankind

through medical profession and their main aim was to make significant research which would bring them recognition in their profession. About 20 p.c. students aimed at knowing about the human phenomenon. Nearly 18.6 p.c. of the students have stated that they did not have any other choice for their study. To them circumstances gave no other option. 10.9 p.c. stated to secure good job, 7.27 p.c. were interested in practicals of Biology & 5.9 p.c. had good achievement in the subject.

II. Who motivates them to offer biology :

With regards to the choice of the subject of study of biology, students gave number of factors as shown in the following table :-

| Who motivated students to offer biology | A | B1 | B2 | C1 | C2 | F | p.c. |
|---|---|---|---|---|---|---|---|
| Self motivated | 40 | 31 | 17 | 50 | 49 | 189 | 85.9 |
| Parents & Family members | 39 | 37 | 20 | 37 | 41 | 174 | 79 |
| Friends | 7 | 14 | - | 5 | 6 | 32 | 14.5 |
| Teachers | 3 | 2 | 1 | - | 2 | 8 | 3.6 |

The table shows that about 85.9 p.c. of students have been self-motivated for pursuing the study of biology. 79 p.c. have been encouraged by parents & other family members to take up biology as an optional subject at the higher secondary stage. 14.5 p.c. of students have been

encouraged and adviced by their friends to choose biology as an optional subject al higher secondary stage. ~~&~~ It may be interesting to note that only 3.6 p.c. of students have been advised by the teachers to take biology as an optional subject. This shows that our teachers are not explaining and guiding their students for their future plan of study. It has always been stated that teacher plays an important role in educating their students. Actually teacher provides a model for his or her student and they study their teacher as well as books. In science some of the most important learnings can be best achieved through the study of the teacher and the model he presents. It is a moral duty of every teacher to advice their students to think what they are going to do or plan for future.

The analysis of data reveals that more than 85 p.c. of students have been self-motivated to take up the subject for higher secondary as an optional subject. 79 p.c. are bound by parental ideas. This may be relective of a desire on the part of the students to appear as "self made man".

III. Whether teachers help is needed to learn biology

Most of the students feel that they can study biology of their own if the teachers help is not available. Nearly 46.4 p.c.(102 out of 220) of students can study biology without teachers help and 44 p.c. of students responded negatively to the question.

The frequencies of individual schools shows that

nearly 62 p.c. of the convent school students have given negative response and only 34 p.c. responded positively to it. Whereas other schools frequencies show that nearly 50 p.c. of the students are willing to study biology of their own without any teachers help or guidance (B1 50 p.c., B2 50 p.c.; C1 52 p.c., C2 58 p.c.).

This shows that convent school is the only school which forms "spoon feeding" habit in students and when left to themselves the students are unable to proceed in their studies. At least it is certain that Convent Students need their Biology teachers for study. In other schools students neither offer biology at the instance of teachers nor they depend upon them for studies.

| | A | B1 | B2 | C1 | C2 | Total | p.c. |
|---|---|---|---|---|---|---|---|
| Yes | 17 | 20 | 10 | 26 | 29 | 102 | 46.36 |
| No | 31 | 15 | 10 | 22 | 23 | 101 | 45.9 |

## IV. Aims and Objectives of Biology Teaching

Two types of aims and objectives were visualized. One set of aims relating to theory teaching and other relating to Laboratory work. The objective of practical work is gaining of experience of natural phenomena & there are various ways in which it can be achieved. Most of the time of student is consumed in doing dissection in Biology practicals. In addition, it is the purpose of indoor studies to interpret and explain what has been observed outside the laboratory too. The practical test evaluates the students success in grasping the

the relationship between the theory and practice of the science they study. The ∮ test calls for a thorough understanding of theory and use of the skills of observation, manipulation, and critical thinking that they developed. But unfortunately there is very little integration of theoretical lessons and practical work in our schools. The fact is that theory is taught in the Xclassroom and practical is done in Laboratory. Therefore the two questions elicited their opinions regarding the aims & objectives of Biology teaching both theory and practical. Opinions regarding to what extent these objectives were realized on a three point scale i.e. (a) fully realized (b) partially realized (c) not realized at all were also asked in the questionnaire but few teachers have given their opinion about the realization of the objectives. The main aims and objectives are given as follows as per teachers opinions.

1. Fundamental knowledge Aim :

| | Frequencies |
|---|---|
| a) To impart knowledge | 3 |
| b) To understand the working of our body | 1 |

2. Functional Understanding

| | |
|---|---|
| a) Application of knowledge in daily life | 3 |
| b) To impart knowledge about structure of science | 1 |
| c) To reveal the secrecy of the scientific events | 1 |
| d) To impart the knowledge of the origin of life | 1 |

| | Frequencies |
|---|---|
| e) Application of knowledge in daily life | 3 |
| 3. Scientific Attitude | |
| a) To develop scientific attitude | 8 |
| b) To develop ability to understand the impact of Biology upon our way of life | 6 |
| c) To make them understand the process of Heredity and evolution | 2 |
| d) To create enthusiasm and curiosity in learning | 1 |
| e) To develop ability to judge time and false | 1 |
| f) To be able to recollect the fundamental similarities in an organism | 1 |
| 4. Scientific Interest and Appreciations | |
| a) To create interest in plants and Animals | 9 |
| b) Acquisition of funds of Information concerning Plants and Animals | 6 |
| c) To introduce to nature | 5 |
| d) Use of Plants and animals in welfare of man | 4 |
| e) To create interest in Medical science | 3 |
| f) To create interest in science hobbies | 2 |
| g) To prepare science scholars | 2 |
| h) To prepare students for future studies or profession | 1 |
| i) To create interest in Agriculture | 1 |
| j) To create interest in natural phenomenon | 1 |
| k) To seek good profession | 1 |
| l) To introduce students to the life of scientists | 1 |

| | Frequencies |
|---|---|
| m) To develop hygienic habits | 1 |
| n) To produce more clothing and food | 1 |
| o) To help them to understand the economic importance of plants and animals | 1 |
| p) To influence to improve crop production | 1 |
| q) To protect wild life | 1 |
| r) To uplift the dignity of labour | 1 |
| s) To prepare good citizens | 1 |

5. Scientific Skills

| | |
|---|---|
| a) To enable the students to explore the wonders of nature i.e. observation skill | 5 |
| b) To develop skill in systematic procedure | 4 |
| c) To develop skill in drawing | 3 |
| d) To develop constructive attitude | 2 |
| e) To develop skill to handle apparatus and Instruments | 1 |

Aims & Objectives of Practical Work

The ability of the students to think scientifically is being tested in the theoretical questions, and it is desirable to include such questions in the practical examination. The practicals should be confined strictly to the practical details. Those particular questions should be strictly designed to test the manual skill of the students to apply his theoretical knowledge in the practical work. What-ever may be said in favour of such classification of examination's assessment, when it is combined together with

the main aim and objective of the work is the passing of examinations. The opinions of the Biology teachers for the laboratory work is to be able to develop successfully some of the objectives which are given below :

1. Scientific skills :

| | |
|---|---|
| a) To develop skill in observing and recording the data correctly. | 7 |
| b) To develop skill in setting and handling the apparatus | 7 |
| c) To develop skill in drawing | 5 |
| d) To develop skill in Dissection | 4 |
| e) To develop skill in learning by doing | 4 |
| f) To form habit to work in laboratory | 2 |

2. Scientific Attitude

| | |
|---|---|
| a) To create scientific attitude | 6 |
| b) To stimulate thinking | 2 |
| c) To develop rational thinking | 1 |
| d) To differentiate animals from plants | 1 |

3. Functional Understanding

| | |
|---|---|
| a) To develop problem solving attitude | 2 |
| b) To acquaint students with living objects | 2 |
| c) To study the verious parts of living body | 2 |
| d) To impart practical knowledge | 2 |

4. Scientific Interest and Appreciation

| | |
|---|---|
| a) To understand the theory part | 7 |
| b) To arouse interest in the subject & nature | 6 |
| c) To create cooperative attitude | 3 |
| d) To prepare students for future studies | 2 |

| | Frequencies |
|---|---|
| e) To form science hobbies | 1 |
| f) To develop self-confidence | 1 |
| g) To apply knowledge in practical life | 1 |
| h) To prepare students for Agriculture and Horticulture | 1 |
| i) To create interest in Research | 1 |
| 5. To pass examination | 1 |

V. Some Aspects about Laboratory Work

a) Organisation

The Science students are increasing day by day and the teachers are facing complex problems for arranging practicals for the students. There is over crowding in the laboratory and situation becomes worse because the number of groups into which a class is divided does not give the idea the way the practical work is to be conducted. The number of students who can be accommodated in a Biology laboratory depends upon the dimensions of the laboratory. But usually the Biology laboratory can accommodate 30 to 35 students at a time, and the quality of practical work is hit very badly if the number exceeds this.

The following figures show that different schools have different sizes of the Biology laboratoryes ; Out of the 25 schools 20 have responded in which two schools have common laboratory for physics, Chemistry and Biology. The rest of the schools have different sizes of Biology laboratory, 5 schools have the size of 40' x 20'; two schools have 60' x 30', dimension of Biology laboratory, and two have the size of 20'x10',

The rest schools have the following idividual sizes

40' x 20' (N = 5)

60' x 30' (N = 2)

20' x 10' (N = 2)

24' x 16' , 18' x 18; 24' x 20'; 45' x 30'; 35' x 15';

25' x 15'; 15' x 12'; 20' x 15'; 30 x 20'.

As regards the furnishing of the Biology laboratory number of tables varies from 2 to 45 and number of students on each table varies from 1 to 10 (excepting in one where it is 30 as shown in the following table.

Table showing number of students on each Table

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No.of Tables | 45 | 30 | 22 | 20 | 20 | 17 | 10 | 9 | 9 | 6 | 6 | 5 | 5 | 5 | 5 | 4 | 3 | 2 | 2 | 2 |
| No.of students | 1 | 1 | 2 | 1 | 1 | 1 | 4 | 3 | 3 | 2 | 4 | 4 | 10 | 10 | 6 | 4 | 30 | 10 | 8 | 8 |

The sizes of the laboratories and their furnishing shows that 28 p.c. to 30 p.c. schools have well furnished Biology laboratory in which well fitted dissecting tables are available. As per the above table, where one student or to students won on each table indicates that they have ordinary tables which are not fitted with taps and sinks for dissection purposes.

The sizes of the laboratories in each school shows that there is no proper provision of Biology laboratory but ordinary classrooms are used as laboratory, which is furnished with ordinary tables for practicals.

In eight schools there were no groups for the Biology practicals, the practicals are conducted class-wise. To of the schools have stated that thy do not conduct any practical work in IX and X classes and only x class have practicals. Where number of students in each group exceeds 20-25. This certainly affects the quality of practical work, where there are no separate laboratory for each stream of science namely physics, Chemistry and Biology the condition is still worse. Thus the main factors affecting the quality of practical work in Biology are, limited space and the lack of proper supervision. For the supervision of practical work approximately 72 p.c. of the teachers have given their opinion that only single teacher has to carry on all the practical work in all classes i.e. IXth and X and XI.

In Biology, as there are no such experiments except few physiological experiments in which students can be grouped by 2 to 4 students. 36 p.c. of schools have groups of 2 students, 20 p.c. of the schools have group of 4 students and the rest i.e. 44 p.c. of schools have provision for individual practical work. Actually the major part of the Biology practical is the dissection which can not be done in group. It has to be performed individually by each student. Thus there is no such problem of too many or large groups doing the dissection.

b) <u>The Requirements</u>

Number of students taking science is increasing rapidly without proportionate increase in physical facilities in our schools. As per the responses received some schools

have qualified Biology teachers but without adequate laboratory facilities or no laboratory at all. Some schools have common laboratory for all the three science streams namely, Physics, Chemistry and Biology. This difficulty is accentuated by some more problems, which the Biology teacher has to face; namely over crowding of the classes, poor accommodation, lack of essential practical material.

Out of 25 teachers 84 p.c. of teachers responses showed that they do not have trained Laboratory assistant and only four i.e. 16 p.c. have this facility. Out of these 16 p..c. of schools only 4 p.c. have separate laboratory Assistants for each laboratory ie. Physics, Chemistry and Biology and 8 p.c. have common laboratory assistants. In schools which have the facility of laboratory assistant have to do or arrange every thing for the practicals on their own as these laboratory assistants are engaged for some other work of the school. Some of the teachers have even stated that they do not have practical period in the time-table. They have to arrange practicals after school hours. So it is not possible for a teacher to carry on teaching work with interest and also to give individual attention. In addition to lack of all the physical facilities due to the lack of funds and laboratory material some teachers have stated that most of the students joining science stream posses no basic knowledge of scientific facts. The teaching of general science upto VIII class is illusory and no guidance is available at homes.

Some of the problems faced by Biology teachers are given below :

| S.No. | | Frequencies |
|---|---|---|
| 1. | No trained lab assistant | 14 |
| 2. | Lack of funds and Laboratory material | 12 |
| 3. | Lack of space | 7 |
| 4. | Shortage of time for practicals | 6 |
| 5. | Lack of furniture and water facility | 4 |
| 6. | No froggary | 4 |
| 7. | Supply of material is not prompt | 2 |
| 8. | Frogs are not supplied in time | 2 |
| 9. | No botanical garden | 2 |
| 10. | Individual attention is not possible due to overcrowding of class | 2 |
| 11. | Checking and correction of records is not possible | 1 |

C) Difficulties faced in equipping Biology laboratories

Nearly 10 p.c. did not experience any difficulty in equipping the laboratory. The remaining teachers experienced a lot of difficulties in the course of equipping the Biology laboratory. One of the inherent of difficulty is the grants available to them. 12 p.c. of them have mentioned that they get Rs.1000/- to 2000/- on an Annual grant, 8 p.c. get Rs.100/- to 150 as annual grants, 8 p.c. get Rs.150-200 and 16 p.c. of the teachers have stated that there is no definite grant available. 24 p.c. get no grant at all and about 30 p.c. gave no response to it. 4 p.c. of teachers mentioned that sufficient amount is available but the amount is not given for use. On the whole about 20 p.c. of the

of the teachers gave their opinion that the amount available to them is sufficient but 65 p.c. of teachers have mentioned that the amount is not at all sufficient.16 p.c. of teachers gave no response to this query. About the purchases of the laboratory material 80 p.c. of the schools experienced difficulties as they have to submit the list to the head office. 8 p.c. have the supply of material through D.S.E. office; 8 p.c. have no supply of the material. They have to do the purchases by taking science fees (Private schools) 4 p.c. get the official list. The list is sent to the head office and the list prepared by D.S.E.(Divisional Superintendent of Education) has to face similar difficulties. They have to keep on waiting for the supply of material for a long time, and the materials are not available in time. Some times they have also to obtain these from the Central Stores of the Department. More over what ever is available in the stores had to be accepted and have to go on reminding for the rest of the material. Thus, Teachers freedom to equip their laboratories, according to their needs is curtailed.

d) Difficulties faced by teachers

There is a general impression that science teachers always demand more and more funds for equipping their laboratories as well as for the purchase of laboratory material. The data shows that most of the Biology teachers i.e. 20 p.c. of them demanded from Rs.500 to Rs.2000. in addition to the existing funds or grants, for the purchases of laboratory material as preserved specimen, acquarium, models etc.

4 p.c. demanded Rs.5000, 9 p.c. did not mention the amount and nearly 50 p.c. did not give response to this. Science teachers were frustrated because they can make certain basic necessary purchases for conducting laboratory work and demonstrating their lessons; in the classroom. One can imagine the frustrations of a science teacher who tries hard to improve classroom teaching but fails to procure the necessary material for the use. Some of the teachers have given the different arrangements made for the purchase of the necessary laboratory material. 4 p.c. have mentioned that their office arranges; 8 p.c. use the Annual fund of the school; and nearly 50 p.c. did not give any response to this. 12 p.c. mentioned that there is no alternative arrangement for equipping the laboratory. Thus one can imegin the condition of Biology laboratories in our schools. Biology teachers try hard but fail to get the necessary requirements. The teachers wished to spend these grants for the purchases of Microscopes, Microscopic slides, preserved specimen, acquarium, building up of froggary, necessary arrangement for the preservation of dissected frogs and other collected materials etc.

Those who were not satisfied gave the following suggestions:

1. The teachers should be given freedom to purchase the laboratory material from reputed firms.
2. The list sent by the teachers should be considered and supply of material should be arranged in time.

3. There should be separate trained laboratory assistant for each science laboratory. And laboratory assistant should not be engaged in some other work of the school, at least he should be present at the time of the practicals.
4. The official list supplied in some schools does not contain some of the articles of most frequent use. The list may be prepared but it should not be prescriptive one.
5. Head of the institutions in consultation with the concerned subject teacher should be allowed to pick and choose the best for the money. There is one more problem which the State Govt. schools have to face. Some times the Central Store fails to supply the needed material and equipment. It then dumps other material on the school which are not required by the school. This defeats the very purpose of setting up the Central stores.

e) Difficulties faced by Students

Some of the difficulties faced by the students during the practicals are as follows :

| | Frequencies |
|---|---|
| 1. No proper guidance in practicals | 104 |
| 2. Distinguishing and explanations of slides is not done in the class | 57 |
| 3. No guidance in Dissection | 25 |
| 4. Less time is given for practicals | 56 |

| | Frequencies |
|---|---|
| 5. Laboratory is not well equipped | 44 |
| 6. No silence is maintained in the class | 40 |
| 7. No proper drawing skill and labelling of sketches | 27 |
| 8. Over crowdeding of the class, no individual attention | 26 |
| 9. No proper space for the practicals | 7 |

Only 33 said that they had no difficulty. This shows that students have to face multiple problems during the practicals. The reasons can be many; no funds available, if it is available it is not sufficient; over crowding in the class; no proper space for conducting practicals etc. The major difficulty in biology practicals in our schools is that microscopes and microscopic slides which are the main tools of Biology practicals are not available. Since these materials are very costly all schools cannot afford to purchase. In such schools students suffer to a great extent. Even the students have to purchase the living frogs for dissection purposes. Teachers too do not take interest in practicals during the practical periods. They start the practicals and do their own work in the laboratory or chit chat with the colleagues.

Each microscopic slide should be explained by the teacher along with good illustrative diagrams of the same slide. Otherwise it becomes very difficult for the students to identify the same. No specimen are available in the laboratory and thus the identification and classification of specimen is very difficult for students.

No proper discipline is maintained during the practicals as teacher is usually busy in his work or sometimes busy in discussions with colleagues, and some times students of other classes disturb. Individual attention is not possible where there is over crowding of the students.

III. Syllabus

Teachers of India are not free to develop their course of study for their pupils. The syllabus is prescribed by the Board of Secondary Education and Department of education. The teachers only try hard to cover the course during the time of 8 to 9 months. It was therefore considered appropriate to seek teachers' opinion as well as students opinion about the syllabus.

Regarding the effectiveness of the present general science syllabus in the middle classes i.e. VI, VII, VIII. 44 p.c. of teachers opined that it was quite effective; 12 p.c. opined that it was not so effective; 4 % said that it was very exhaustive; 8 p.c. suggested to make use of the NCERT syllabus. The rest gave no response.

Regarding the effectiveness of the Biology syllabus at higher secondary level, 20 p.c. of the teachers gave no response to it, 36 p.c. of the teachers gave their opinion that it is already very exhaustive. The Biology teachers gave a number of suggestions for additing and deleting topics from the present syllabus.

Topics of for adding in the syllabus.

1. Genetics 8 p.c.
2. Human Biology 16 p.c.
3. Modern Biology i.e. Molecular biology 8 p.c.
4. Ecology & Ecosystem 8 p.c.
5. Physiology of nutrition 4 p.c.
6. detail study of an insect(cockroach 8 p.c.
7. Biological control 4 p.c.
8. Inter dependence of plants & animals 4 p.c.

They have also ~~gm~~ suggested that there should be sufficient flexibility in the gradation of the topics. The teacher should be given full responsibility to decide himself what topics should be taught in what classes. As most important function the science teacher has to perform is that of arguing with the students. It is through the cut and thrust between teacher and taught that the intellectual interest of the students may be stimulated. For the topics to be deleted from the present biology syllabus about 56% of the teachers gave their opinion as none should be deleted, 12 p.c. gave no response to it and four out of 25 teachers suggested that the following topics should be deleted.

1. Balance of Nature from IX class 4 p.c.
2. Ecogyseum 4 p.c.
3. Families 4 p.c.
4. Poisonous & Non-poisonous snakes 4 p.c.
5. R.N.A. & D.N.A. 4 p.c.

Students of XI class were also asked to give their topics of interest in the present syllabus. It is found that the question has been properly responded, very negligible percentage of the students from each school has not responded. From the responses received the following topics and sub-topics have been suggested as interesting & easy topics. Since the topics and sub-topics given were so varied and large in number that it has to be grouped as follows(Table No.6.1,2,3)

1. The systems of Frog N = 268
2. Gen. Botany- 188
3. Gen. Biology N = 87
4. Gen Zoology = 94
5. Plant Anatomy & Physiology = 29
6. Gen. Zoology N = 7

As regards the systems of Frog many students have not given the specification of the systems of Frog in which they are interested even though quite a large number of students have mentioned the specifications of the topics, which we give as follows with the frequency numbers.

Table No. Chart Showing the frequency & topics

| S.No. | Topics of Systems of Frog | A | $B_1$ | $B_2$ | $C_1$ | $C_2$ | Total F |
|---|---|---|---|---|---|---|---|
| I. | Circulation Frog | 11 | x | 9 | 23 | 8 | 51 |
| | Systems of Frog | 18 | 7 | 10 | 6 | 8 | 49 |
| | Nervous system | 4 | x | 3 | 15 | 7 | 29 |
| | Development of Frog | 3 | x | 5 | 14 | 5 | 27 |
| | Respiration | 7 | x | 5 | 8 | 4 | 24 |

| S.No. | Topics of Systems of Frog | A | $B_1$ | $B_2$ | $C_1$ | $C_2$ | Total F |
|---|---|---|---|---|---|---|---|
| | Reproduction | 2 | x | 5 | 2 | 5 | 14 |
| | Skeleton | 3 | x | 3 | 7 | 1 | 14 |
| | Urinogenital system | 4 | x | x | 4 | 6 | 14 |
| | Heart of Frog | x | x | 3 | 2 | 7 | 12 |
| | Morphology of Frog | 2 | x | x | 4 | 2 | 8 |
| | Anatomy of Frog | x | x | x | 1 | 5 | 6 |
| | | 60 | 7 | 45 | 90 | 60 | 268 |
| II. | Plant Kingdom | | | | | | |
| | Pollination | 1 | x | 5 | 10 | 7 | 23 |
| | Spirogyra | 1 | x | 1 | 13 | 6 | 21 |
| | Families | x | 6 | x | 7 | 6 | 19 |
| | Mucor | 1 | x | 1 | 10 | 6 | 18 |
| | Morphology and Anatomy of Plant | 2 | x | 6 | 4 | 5 | 17 |
| | Structure of Flower | 2 | 1 | 2 | 3 | 8 | 16 |
| | Fern | x | x | x | 12 | 3 | 15 |
| | Fertilization | 3 | 1 | 2 | 7 | 2 | 15 |
| | Plant Kigdom | 1 | 4 | 1 | 7 | 6 | 19 |
| | Anatomy of Plant | 2 | x | x | x | 8 | 10 |
| | Lower Plants | 1 | x | x | 4 | 5 | 10 |
| | Fruits | 2 | x | x | 4 | 2 | 8 |
| | Ecosystem | x | x | 1 | 1 | 6 | 8 |
| | Modifications of Plant | 2 | 3 | 1 | x | 2 | 8 |
| | Ecology | 4 | 2 | x | x | 1 | 7 |
| | Bacteria & Virus | x | 2 | x | 1 | 3 | 6 |

| S.No. Topics | A | $B_1$ | $B_2$ | $C_1$ | $C_2$ | Total |
|---|---|---|---|---|---|---|
| Dispersal of seeds and Fruits | 2 | x | x | x | 4 | 6 |
| Insectivorous Plants | 1 | x | x | x | 4 | 5 |
| Parts of Plant | x | 1 | x | x | 2 | 3 |
| Seeds | 1 | x | x | x | x | 1 |
| | 26 | 20 | 20 | 83 | 86 | 235 |
| III. General Biological Topics | | | | | | |
| Evolution | 28 | 9 | 1 | 5 | 6 | 49 |
| Cell Division | 6 | x | 3 | 6 | 8 | 23 |
| Cell | 1 | 15 | 2 | x | 3 | 21 |
| Tissue | 3 | 2 | 2 | 6 | 5 | 18 |
| Genetics | 2 | 15 | x | x | x | 17 |
| Heredity & variation | 6 | 6 | x | x | 1 | 13 |
| Origin of life | x | 9 | x | x | x | 9 |
| Gen.Life Histories | 5 | x | x | x | 3 | 8 |
| R.N.A. and D.N.A. | x | 1 | 3 | x | 4 | 8 |
| Emargology | x | 2 | x | 1 | x | 3 |
| Neurology | x | 2 | x | x | x | 2 |
| Hormones | x | 2 | x | x | x | 2 |
| Taxanomy | x | 2 | x | x | x | 2 |
| Gametogenesis | 2 | x | x | x | x | 2 |
| Sense organs | x | x | x | x | 2 | 2 |
| Micro Biology | x | 1 | x | x | 1 | 2 |
| Slide making | x | x | x | x | 2 | 2 |
| Nomenclature | 1 | 1 | x | x | x | 2 |
| Chromosomes | x | x | x | x | 1 | 1 |

| S.No. Topics | A | $B_1$ | $B_2$ | $C_1$ | $C_2$ | Total |
|---|---|---|---|---|---|---|
| Paleontology | x | x1 | x | x | x | 1 |
| Interdependence of Plants & Animals | x | x | x | x | 1 | 1 |
| | 54 | 68 | 11 | 18 | 37 | 188 |
| IV. Genzoology | | | | | | |
| Anatomy, Physiology of Animals | 1 | 16 | x | x | 3 | 20 |
| Reproduction in Animals | x | 14 | x | x | x | 14 |
| Human Diseases and cure | x | 11 | x | x | x | 11 |
| Blood | 1 | x | 2 | 3 | 4 | 10 |
| Brain | x | x | 1 | x | 5 | 6 |
| Dissection of Frog | x | x | x | x | 4 | 4 |
| L.H.of Mosquito & Parasite | 4 | x | x | x | x | 4 |
| Endocrine | 1 | x | 2 | x | x | 3 |
| Anoeba | 3 | x | x | x | x | 3 |
| Snakes | x | x | x | x | 2 | 2 |
| Aves | x | 2 | x | x | x | 2 |
| Medicine | x | 2 | x | x | x | 2 |
| Histology | x | 2 | x | x | x | 2 |
| Mammals & Cockroach | x | x | x | x | 1 | 1 |
| F.L.H. of T. Solium | 1 | x | x | x | x | 1 |
| Cure of injury | x | 1 | x | x | x | 1 |
| | 11 | 48 | 6 | 3 | 19 | 87 |

| S.No. Topics | A | $B_1$ | $B_2$ | $C_1$ | $C_2$ | Total F |
|---|---|---|---|---|---|---|
| V. Plant Physiology | 2 | 4 | 6 | x | 3 | 15 |
| Transpiration | x | x | 4 | x | 2 | 6 |
| Growth | x | x | 1 | 1 | 1 | 3 |
| Respiration in Plant | x | x | 1 | x | 1 | 2 |
| Photosynthesis | x | x | 1 | x | 1 | 2 |
| Osmosis | x | x | 1 | x | x | 1 |
| | 2 | 4 | 14 | 1 | 8 | 29 |
| VI. Zoology as a whole | 4 | 1 | x | x | 2 | 7 |

VII. Causes of Failure

" A difficult examination will sort out the ablest candidates and bunch the weak ones together. An easy examination will do the reverse and sort out the weak ones but bunch the ablest". Examinations are compulsory for the higher class promotions in our country. Every year we note that a large number of students fail in the public examinations. It is a great problem which causes suffering and misery for those who fail which is equally shared by the parents and Teachers.

The following are some of the causes of failures given by students and teachers.

1. No regular study habit (N = 87), including many similar reasons as it includes carelessness (N = 27), not knowing the method of answering (N = 24), no self-study(N=19); no hard work (N = 18); craming habit (N = 17) easy subject(N=12);

no serious study (N = 9) no concentration while studying(N=9), topics are not clear (N=8); depend on teacher (N=6); no proper method of study (N = 5); no revision habit (N = 3) over confidence (N = 3); Selective study (N = 3); think as a burden (N = 3); difficulties are not asked (N = 2), study at eleventh hour( N = 2); cheating (N= 2); Guessing(N = 2); No writing habit (N = 2); use of guide (N = 1).

2. Teacher is not good which includes various aspects of Teacher. Teachers do not take teaching seriously and majority are not interested in teaching. Many teachers are goudge taking as well as the method of their teaching is defective.

3. There is a fashion now a days to be called as a Science student. And many students take biology thinking it as an easy subject though they have no interest in the subject.

4. They do not have proper skill in Drawing Biology is full of diagrams unless a student describes or answers with a labelled diagram he can not expects good marks. About 50 p.c. of the marks are allotted for Diagrams only. Others Thus Biology students must posses good drawing skill.

5. Choice is forced. Many students take up Biology because they are not interested in Arts and Maths is very hard for them so they think they can carry on with Biology.

6. Many students do not possess adequate knowledge as they reach the higher secondary. Due to the internal examinations in the lower classes they are promoted by manipulation. The pressure emanates partly from parents and

partly from pupil, as well as external bodies. Pressure for success in examination is one of the saddest factors operating in the present situation. This happens partly due to the negligence of Headmasters and teachers and partly due to low standard of integrity and character of teacher community and public at large.

The result of this is that when they reach in the Higher Secondary classes they sit blank in the classes not knowing the basic knowledge of the terminology and other information. Thus they lack understanding of the topics which are being taught in the class. Where there is no basis of any science. The subject, from their point of view becomes very hard to them.

7. Economic status of many students is very poor so they have to face large number of complex problems in the process of learning. They do not get enough time and space at home for studies. Environmental effect is also there. If the locality in which they are residing is not good, they will form a bad friends circle thus bad habits will be developed which will hinder the studies.

8. Administrative problems are also one of the cause of failure. This can include ffacilities for practicals in Biology, lack of proper space for conducting practicals, sometimes courses are not completed. No proper material available for teaching some times no proper time is given in the timetable for the practicals.

9. Tournaments and other activities occupy the minds of the students for a number of months and students continually absent themselves from classes.

10. The classes are overcrowded and therefore individual attention towards weak students, correction work or checking of assignments is not possible. Sometimes teachers are kept busy in co-curricular activities or clerical work at the cost of studies.

Causes of Failure

| S.No. Causes | A | $B_1$ | $B_2$ | $C_1$ | $C_2$ | Total |
|---|---|---|---|---|---|---|
| I. No Regular Study Habit | 18 | 17 | 7 | 22 | 23 | 87 |
| Carelessness | 7 | 10 | 5 | 3 | 2 | 27 |
| No hard work | 9 | 7 | 5 | 1 | 5 | 27 |
| Not knowing the method of Answering | 4 | 10 | 4 | 1 | 5 | 24 |
| No self study | 2 | 3+3 | 2+1 | 4 | 8+2 | 25 |
| Craming habit | 6 | 6 | 2 | 2 | 1 | 17 |
| Take as an easy subject | 1 | 1 | 3 | x | 7 | 12 |
| No concentration while studying | x | 5 | x | 1 | 3 | 9 |
| Topics are not clear | x | x | 1 | 3 | 4 | 8 |
| difficulties are not asked | x | x | 2 | 3 | x | 5 |
| No proper method of study | 2 | x | 1 | x | 2 | 5 |
| Not revising frequently | x | 1 | 2 | x | x | 3 |
| Over confidence | 1 | 2 | x | x | x | 3 |
| Selective study | x | 1 | 1 | 1 | x | 3 |

| S.No. | Causes | A | $B_1$ | $B_2$ | $C_1$ | $C_2$ | Total |
|---|---|---|---|---|---|---|---|
| | Think as a burden | 2 | x | 1 | x | x | 3 |
| | Study at eleventh hour | x | 2 | x | x | x | 2 |
| | Guess questions | 2 | x | x | x | x | 2 |
| | No study habit & writing habit | 1 | x | x | 1 | x | 2 |
| | Cheating habit | x | 2 | x | x | x | 2 |
| | Not preparing good notes | x | x | 1 | x | x | 1 |
| | Use of guide | x | x | 1 | x | x | 1 |
| | | 55 | 70 | 39 | 42 | 62 | 268 |
| II. | No interest | 26 | 23 | 3 | 22 | 16+1 | 91 |
| | Not paying attention in class | 16 | 10 | 5 | 4 | 16 | 51 |
| | Not attending school regularly | x | 2 | 1 | 6 | 3 | 12 |
| | No interest in practical work | 3 | 1 | x | x | 2 | 6 |
| | High standard Books | x | x | x | x | 1 | 1 |
| | | 45 | 36 | 9 | 32 | 40 | 162 |
| III. | No understanding of subject | | | | | | |
| | Do not understand the subject | 12 | 15 | 4 | 12 | 12 | 55 |
| | Subject is hard | 8 | 3 | x | 2 | 4 | 17 |
| | Terms are hard | 1 | x | x | 1 | 4 | 6 |
| | Terms are in English | x | x | 1 | 6 | x | 7 |
| | Descriptive Subject | x | x | x | x | 1 | 1 |
| | Skeletal system is Hard | x | x | x | 1 | x | 1 |
| | Low I.Q. | x | 1 | x | x | x | 1 |
| | | 21 | 19 | 5 | 22 | 21 | 88 |

| S.No. | Causes | A | $B_1$ | $B_2$ | $C_1$ | $C_2$ | Total |
|---|---|---|---|---|---|---|---|
| IV. | No proper skill in drawing | 19 | 7 | 12 | 29 | 19 | 86 |
| V. | Teacher is not good | | | | | | |
| | No proper Teaching | 1 | x | 2 | 13 | 7 | 23 |
| | Teachers are not interested in Teaching | 7 | 2 | 2 | 1 | 1 | 13 |
| | Teaching method is not good | x | x | x | 6 | 1 | 7 |
| | Teacher is grudge Taking | x | 1 | x | x | 3 | 4 |
| | Strict evaluation | 1 | x | x | x | 2 | 3 |
| | Teacher is not qualified | 1 | x | x | x | 2 | 3 |
| | Teacher is partial | 1 | x | 1 | x | 1 | 3 |
| | Dislike the Teacher | 1 | x | x | 1 | 1 | 3 |
| | Teacher Teaches too much in one period | 1 | x | 1 | x | x | 2 |
| | Teacher is not good | x | x | x | x | 2 | 2 |
| | Not completing theory portion | x | x | x | 1 | x | 1 |
| | Bad behaviour of Teacher | x | x | x | x | 1 | 1 |
| | Teacher is not strict | x | x | x | x | 1 | 1 |
| | Teacher gives too much H.W. | x | x | x | x | 1 | 1 |
| | Modern system of Education is not good | x | x | 1 | x | x | 1 |
| | | 13 | 3 | 7 | 22 | 23 | 68 |
| VI. | Choice is Forced | 17 | 5 | 2 | 10 | 10 | 44 |
| | Week memory | 11 | 4 | x | 5 | 9 | 29 |
| | Maths is Hard | x | x | 1 | x | 1 | 2 |
| | No choice | x | x | 1 | x | x | 1 |
| | | 28 | 9 | 4 | 15 | 20 | 76 |

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| S.No. | A | $B_1$ | $B_2$ | $C_1$ | $C_2$ | Total |
|---|---|---|---|---|---|---|
| VI. Economic Status of the Students | x | x | x | 7 | 2 | 9 |
| Personal Problems | 2 | x | x | 4 | 2 | 8 |
| Not able to buy books | x | x | 1 | 1 | 6 | 8 |
| Home conditions are not good | x | x | x | x | 6 | 6 |
| Friend circle is not good | x | x | x | x | 5 | 5 |
| Locality is not good | x | x | 1 | x | 3 | 4 |
| Language problem in expressing | 1 | 3 | 1 | x | x | 5 |
| Slow writing | 2 | x | x | x | 2 | 4 |
| No guidance at home | 1 | x | 2 | x | x | 3 |
| No facility to study at Home | x | 1 | x | 1 | x | 2 |
| No proper space at home for study | x | x | 1 | x | 1 | 2 |
| No knowing importance of Biology | x | 1 | 1 | x | x | 2 |
| Bad habit | x | x | x | x | 1 | 1 |
| S No | 6 | 5 | 7 | 13 | 28 | 59 |
| VIII. Administrative problems | | | | | | |
| Course bulky | 2 | 1 | x | 1 | 10 | 14 |
| Course is not completed in time | x | 1 | x | 1 | 2 | 4 |
| Less time for practical work | x | x | x | 2 | 1 | 3 |
| No practicals are conducted | 1 | 1 | x | 1 | x | 3 |
| No practical material available | x | x | 1 | 1 | 1 | 3 |
| No interest in few topics | x | x | x | 1 | 1 | 2 |

| S.No. | A | $B_1$ | $B_2$ | $C_1$ | $C_2$ | Total |
|---|---|---|---|---|---|---|
| Busy in sports | x | x | x | 1 | 1 | 2 |
| No teaching in lower classes | x | x | 1 | x | 1 | 2 |
| No teaching material is available | x | x | x | 1 | x | 1 |
| | 3 | 3 | 2 | 9 | 17 | 34 |
| IX Exams problem | | | | | | |
| Paper was hard | x | x | 3 | 7 | x | 10 |
| Questions were not clear | x | 2 | x | 1 | 5 | 8 |
| Paper was lengthy | 1 | 1 | 2 | x | 3 | 7 |
| Nervous in examinations | 3 | x | 1 | x | x | 4 |
| No expression power | x | 1 | x | x | x | 1 |
| | 4 | 4 | 6 | 8 | 8 | 30 |

VIII. Creating Scientific Interest

One of the objective of practical work is the gaining of experiences of natural phenomenon. There are various ways in which it can be achieved. It depends on in what way the students are brought in contact with the pehnomenon, direct of indirect. It is one of the practical work of one kind or another, which alone is capable of providing direct contact with the facts of nature. Some of the direct experiences can be gained in class room by means of Demonstrations, some can be gained in the laboratory by personal xx investigation, but direct experience of many phenomenon can only be obtained in the field. It is only this experience obtained in the field can alter students out look fundamentally and it is possible in xx many branches

of science. It is the Biological science, which is much benefitted by field study. Major part of Biological science can be effectively studied through field trips only. The very word Biology mans that it should be the study of living things. Very often the biological laboratory where we can find nothing at all, but only the sterile dissecting room in our schools. Professor E.A. Milne has described a laboratory as "an isolated portion of the cosmos".

It is the purpose of the indoor studies to interpret and explain what has been observed to occur in field and it is in the field that many of the problems arise. It is desirable to pursue the study of science. Especially of Biology in a spirit of investigation, field trips or studies.

In response to questions related to field study 56 p.c. of the teachers have stated that they take their Biology students for field study. Nearly 36 p.c. of these teachers take their students for field study, twice a year; 12 p.c. of teachers take their students for fomr times a year and 16 p.c. of the teachers take their field trips once a year only. The rest of the teachers do not take their Biology students for field trips or excursions.

In addition to these field trips 36 p.c. of the schools have Botanical garden in their schools. 60 p.c. of schools do not have any garden for the name sake.

The schools which have botanical garden in their schools can make the use of the garden very effectively during the teaching of Biology. But the schools which do not have the facility of having botanical garden cannot take their students for the field trips or study due to variable reasons, for example no facility or convenience for it. Teachers are also not interested due to tight time-table. Many teachers gave reasons which has been previously stated that the practical period is not included in the regular time-table and the teachers have to devote extra time for the laboratory practicals. Heads of the institutions never take pains to know the needs of the science study in their own schools hence teachers who are devoting their extra time for laboratory practicals, how can it be expected from them to take their students for field trips or study on their own responsibility.

Biological museum is also a part of Biology laboratory. 52 p.c. of the schools have the provision of Biology museum and 44 p.c. have no biology museum in their schools and 4 p.c. have given no response to this. Schools which do not have Biology museum can very easily build one with the help of the students, by creating interest in them to collect material, identify them and preserve. This process also needs some sort of field study but there is no hard and fast rule that schools only should provide facility for it. Teacher can motivate students for collecting some botanical as well as zoological specimen when ever they come across any where living material. With the help of the teacher it can be

identified and preserved. This will help in building up of biology museum.

The responses of the teachers for the collection of material is very encouraging. 44 p.c. of the teachers encourage their students to collect some material in order to identify and then to preserve them in the laboratory. 48 p.c. of teachers encourage in preparation of herbarium and 4 p.c. of teachers do not encourage their students for the collection of material etc. 4 p.c. gave no response to this.

Science Fairs

Science fairs include the activities of science club. The greatest value of the science fair is the recognition and encouragement that it gives to the student participants. The school science fair is important because it can include all students who have done some projects. This can be arranged as an exhibition for the school day. The district level fair has the value of providing a wide range of exchange of ideas for teachers & students. All science fairs are forums where ideas and techniques presented by the participants can be picked up and developed by others.

Teachers responses shows that 60 p.c. of Sample schools take part in the Science fairs and 32 p.c. do not take part in science fairs and 8 p.c. did not give any response. The schools which take part in science fairs in various ways, 36 p.c take part by sending charts, 40 p.c. take part by sending models 12 p.c. by sending collected preserved specimen 4 p.c. take part by sending improvised apparatus, 4 p.c. by preparing

students for science essay competition and 4 p.c. by preparing students for science debate. 16 p.c. have not given any response in what way they participate in science fairs. Out of these schools 12 p.c. take part in science fairs at District level, 12 p.c. at Divisional level and 8 p.c. at State level and only 4 p.c. take part at National level and the rest organize the science fairs in school, itself. This shows very few schools take part in science fairs in U.P.

60 p.c. of the schools participate in science exhibition organized by the State Government, and 36 p.c. of schools take no part in science exhibitions at State level. Again 60 p.c. of the schools also organize science exhibition in schools 16 p.c. of school also organize ~~occasionally~~ occasionally and 24 p.c. do not organize any science exhibition in their schools.

## IX. Evaluation and Internal Assessment

As regards the internal assessment and evaluation the responses are as follows :

a) Opinions

20 p.c. of the teachers favoured evaluation on day to day work of the class; 20 p.c. gave their opinion to assess"on the basis of internal examination". 8 p.c. favoured on the basis of practical record. 52 p.c. of teachers have suggested that the interal assessment should be on the basis of over all performance of the students and not on any one basis. The rest of the teachers gave no response to this.

This show that the internal assessment is not much understood by the teachers. Since the question contained the four possible bases for internal assessment, the responses were limited to these four choice only, if it would have been the open ended question more specified opinions would have been received.

b) Difficulties faced in Internal Assessment

Internal assessment leads to many difficulties when many diverse factors are considered by different teachers. The difficulties are both for the students and teachers. Some teachers are too liberal and others are too strict. Some students are too smart and get the maximum benefit from all the teachers by flattery, by hook or by crook, or even they do not hesitate to go to the extent of creating misunderstanding among teachers with the result that the school atmosphere is spoiled.

The number of difficulties faced by the teachers for internal assessment are as follows :

| | p.c. of Frequency |
|---|---|
| 1. Classes are over crowded so that it is impossible to do the internal assessment. | 12 p.c. |
| 2. All the students are not present on the test dates | 4 p.c. |
| 3. Low standard of the students make it impossible to do internal Assessment | 4 p.c. |
| 4. Lack of time | 4 p.c. |
| 5. Less staff or heavy load of work on teachers | 4 p.c. |
| 6. Students indiscipline | 4 p.c. |
| 7. Lack of facilities for monthly tests | 4 p.c |

Only 20 p.c. opined that they had no difficulty.

c) Suggestions for Internal Assessment

| | p.c. of Frequency |
|---|---|
| 1. Daily home work should be carefully assessed | 24 p.c. |
| 2. Weekly Tests should be arranged | 12 p.c. |
| 3. Over all assessment should be done | 8 p.c. |
| 4. Monthly or unit test should be organized | 8 p.c. |
| 5. Teacher should be honest in doing internal assessment | 8 p.c. |
| 6. All aspects of students should be considered | 4 p.c. |
| 7. Monthly test + practical record and home work should be considered | 4 p.c. |
| 8. Limited students should be admitted | 4 p.c. |
| 9. 40 p.c. of marks instead of 10 p.c. should be allotted for internal assessment | 4 p.c. |
| 10. Giving more work to the students will also help in assessing students | 4 p.c. |

d) Position obtained in Schools

As regards the evaluation in schools the responses show that 40 p.c. of the schools evaluation is done by monthly test and Annual examinations, 24 p.c. do on the basis of three terminals and Annual examinations. 12 p.c. do on the basis of monthly test in addition to terminals and Annual examinations. 4 p.c. schools do by unit test only. 4 p.c. of the schools have 3 terminals, half yearly and Annual examinations. 4 p.c. have suggested to evaluate on the basis of six monthly and Annual examinations. 4 p.c. schools include monthly test and practical work and Home work of the students. One of the teacher suggested that 30 p.c., 20 p.c., and 50 p.c. for terminals

terminals, half yearly and Annual examination should be calculated and passing should be on 40 p.c. of the total. This will help increasing discipline among the students and they will give examinations seriously. This shows that our teachers are alert of the evaluation of the students and wish that the perfect evaluation of the student should be done which cannot create any misunderstanding between parents and fellow teachers.

X. School Library

A good library is a must for professional growth of the teachers as it aims to meet the requirements of both the students and teachers. The responses received by teachers shows that the situation of library in our schools is not satisfactory.

28 p.c. of the teachers gave their opinion that libraries of their schools are well equiped for Biology subject. 24 p.c. of teachers have stated that it is also well equipped for students use also. But 64 p.c. of teachers expressed their view that their school library is not equipped for Biology subject for teachers as well as for students too. 4 p.c. teachers stated that it is not sufficiently equipped and 8 p.c. of the teachers gave no response to it.

As regards the number of books in library for biology the frequency of the teachers responses are as follows :

| No.of Books | 11 to 20 | 21 to 30 | 31 to 40 | 41 to 50 | 51 to 60 | 61 to 70 | 71 to 80 | 81 to 90 | 91 to 100 | 101 to 110 | 111 to 120 | 121 to 130 | 131 to 140 | 141 to 150 | 151 to 160 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | 1 | 2 | 1 | 1 | 3 | x | x | x | 3 | x | x | 1 | x | 1 | x |

The above table shows that the condition of school libraries is very poor. Only 2 to 3 i.e. 12 p.c. schools have 50 to 60 biology books in their school libraries; 4 p.c. have 12 to 150 books and 12 p.c. have 100 books in their school libraries. One school stated that they have 1200 books. 20 p.c. of teachers stated they have very few books : no number was given. 16 p.c. gave no response.

As regards the departmental library, only 3 schools out of 25 schools have departmental library and 76 p.c. do not have departmental library and 12 p.c. gave no response.

In response to the question how they get required books of their choice in the library ? 36 p.c. gave response that they request the principal for it. 20 p.c. gave their opinion that the subject teacher give recommendations of the subject books. 20 p.c. stated that they get it purchased by the school. 12 p.c. get the books of their choice from other institutes libraries by issue system. 4 p.c. stated that they request the librarian to get the books on their choice in their libraries. 12 p.c. gave no response and 8 p.c. schools have no provision of getting books from any other sources.

Science Journals

The responses indicate that the journals are for science. The number of schools subscribing to a particular journal is too small. The table below gives a picture regarding the journals subscribed by the schools under study. 80 p.c. of the schools have no provision of science journals in their schools.

Table showing name of journals called by libraries

| S.No. | Name of the Journal | Frequency |
|---|---|---|
| 1. | Science today | 5 |
| 2. | Vigyan Pragati | 5 |
| 3. | Science Reporter | 3 |
| 4. | Career and Courses | 2 |
| 5. | Junior scientists | 1 |
| 6. | School Science (NCERT) | 1 |
| 7. | Activities of Science club-sponsors | 1 |
| 8. | Vigyan patrika | 2 |
| 9. | Span | 1 |

In addition to the school library only 8 p.c. of the schools have the facility near by for more reading material as Govt. College of education, Govt. P.G. classes library and by donation of books. 80 p.c. gave response that they do not have many facility for more reading nearby, and 10 p.c. gave no response to it.

XI. Measures to meet the Individual differences

There is a general impression that individual differences are not and cannot be met in our classrooms. The reason being that the classes are over crowded; there is too much rigidity and uniformity of Biology syllabus. It is taught in the same manner to all pupils regardless of their age, ability, aptitude and needs. The programme of meeting individual differences is not taken care in Indian schools as the concept of differentiated curriculum is yet to develop in our country. The whole educational system is geared to the requirement of the external examinations at the cost of other more important and desirable educational aims, objectives and goals. It is still encouraging to find that some of the biology teachers do make an attempt to provide some sort of individual attention to both slow learners and gifted students.

The responses given by the students are as follows :

a) For gifted students :

32 p.c. of the teachers encourage the gifted students in various ways of which 8 p.c. of the teachers have stated that they allot few students of average & slow learners to each gifted to guide these students in their studies, 28 p.c. of the teacher give extra-reading reference so that gifted students collect the knowledge by reading in libraries. 12 p.c. of teachers give these students some projects to carry on with their guidance. 8 p.c. students encourage the gifted student for science talent research and coach them accordingly. 8 p.c. teachers pay individual attentions to the gifted and some

and some teachers have stated that no sufficient time is to do the needful of the gifted students.

b) For Average Students

16 p.c. of Teachers gave encouragement to the avarage students to study hard. 20 p.c. Teachers help them individually and solve their problems in extra time or within the school hours. 4 p.c. teachers advice them to study regularly, give group discussion give some responsibility to be carry on sincerely and 4 % give questions and assignments to which the teacher correct very carefully and grades are given for encouragements.

c) Slow learners

Various steps have also been taken by few biology teachers for slow learners. 24 p.c. of them give extra time to coach these students, 25 p.c. of the teachers give extra work to be done by these students. 16 p.c. of the biology teachers give special attention and individual attention to these slow learners in their studies. 4 p.c. of the teachers have stated that these students are given simple exercises specially prepared for them, they are seated in the front row of the class, their parents are informed to guide them at their home also, some have even stated that the slow learners are involved in the group discussion and in the activities of House system.

24 p.c. gave no response to this and 12 p.c. stated that no special method is adopted to meet these individual need. One teacher even stated that there was no gifted

student who had offered biology. The reasons for this unsatisfactory state of affairs is the diffective examination system of one country. The teachers prepare their students to get through the external examinations and for this the teachers have to use various methods, threatening, coaxing, drilling, rewarding, punishing, testing and reviewing until the pupils can verbalize the facts. Providing for individuals over the pass marks. Teachers also have no choice here because we do not have a differentiated examination in our country.

XII. Problems of Teachers : Personal and Professional problems are the main factors underlying in teachers and act as an hindrance to their professional and academic growth. Our teachers have to face many problems which have an effect on their teaching also. Especially science teachers who are busy in scientific developments in their schools. They can not participate in this new venture efficiently and effectively if they have many personal and professional problems. Therefore, it was considered necessary to probe into the personal and professional problems of the Biology Teachers. The questions relating to the personal and professional problems has not attracted sufficient response because teachers naturally, hesitate to mention their problems in writing. However, some of the teachers have mentioned their problems which are as follows :

As regards the allotment of the classes 12 p.c. of the Biology teachers have no problems. Whereas 52 p.c. teachers stated that they get the class for teaching according to

their designation and 56 p.c. teachers have stated that they get according to their qualifications. As regards their personal problems 60 p.c. of teachers have stated that they do not have any problem, 12 p.c. of the Biology teachers have stated that classes are over crowded, 4 p.c. stated that unnecessary interference of Non-science teachers, 8 p.c. stated that they cannot pay individual attention as no sufficinent time is their; 4 p.c. stated that they have too much of work load, 4 p.c. have also stated that they have accommodation problem. These problems created very bad effect on the process of teaching of these teachers. In this context sympathetic understanding on the part of the administration and heasmaster can soften their feelings.

The professional problems of teachers can be categorised as follows :

| | Freq. | P.C. |
|---|---|---|
| 1. Frogs are not available in time | 2 | 8% |
| 2. Poor and unfurnished laboratory | 3 | 12 |
| 3. Inadequate facilities | 3 | 12 |
| 4. Callons attitude of administration | 3 | 12 |
| 5. No Lab.Assistant | 2+1 | 12 |
| 6. No proper Electricity arrangement | 2 | 8 |
| 7. No Biology Museum | 2 | 8 |
| 8. Allotment of the subject is not proper | 2 | 8 |
| 9. No Bio.books are available in the Library. | 1 | 4 |
| 10. Poor staff (studdents ) | 1 | 4 |
| 12. No proper recognition in the society so no satisfaction in the profession. | 1 | 4 |

| | Frequency |
|---|---|
| 12. Lack of recognition in society | 1 |

The above table shows that non-availability of adequate Laboratory & Library facilities non-cooperative motives of the Headmaster & colleague, over crowded students and lack of recognition are the major factor which are underlying in creating irritation in biology teachers.

The areas of special interest in biology teachers are as follows :

| Genetics | frequency | M.S. |
|---|---|---|
| Genetics | 9 | 36 |
| Bacteriology | 5 | 25 |
| Cytology | 4 | 16 |
| Zoology as a whole | 4 | 16 |
| Practical aspect of Biology | 3 | 12 |
| Plant Physiology | 2 | 8 |
| Botany as a whole | 1 | 4 |
| Evolution | 1 | 4 |
| Pathology | 1 | 4 |
| Embryology | 1 | 4 |
| Biology-Medium | 1 | 4 |
| Bio-Industry | 1 | 4 |
| Molecular Bio. | 1 | 4 |
| Development of Teaching material | 1 | 4 |

Published work

No body has any published work to his credit. 68% teachers frankly said No - but the rest have not responded to it.

Only one of the teachers has published an article " A moment of endover to reveal the secrecy of life". Only 12 p.c. of the sample Teachers are the members of the Higher Secondary Lectuerers association 68 p.c. of the biology teachers have responded negatively to it and the rest have not responded at all.

XIII. Academic growth

From the analysis of replies to questions in this regard it was revealed that 40 p.c. of the teachers had chances of further promotions and 44 p.c. did not have chance of promotions. The rest of the teachers did not respond.

Majority of the Biology teachers have attended various Refresher courses in Biology which are as follows :

| | Fr. | P.C. |
|---|---|---|
| 1. Summer Institute in Biology | 4 | 16 |
| 2. All India Science Seminar | 2 | 8 |
| 3. All India Science Teachers Conference | 1 | 4 |
| 4. Bio - meeting | 1 | 4 |
| 5. Bio. Teachers Association | 1 | 4 |

The table shows that only few teachers have attended some seminar or conference, of which 16 p.c. have attended summer institutes in Biology, 8 p.c. have attended All India Science Seminar, 4 p.c. All India Science Teachers Conference, 4 p.c. Bio-meeting & 4 p.c. Bio. Teachers Association. 44 p.c. have not attended any Seminar or

conference, 24 p.c. have not responded to the question. Most of the teachers who have attended various seminars, summer institutes, conferences seems to have been benefitted. Some of the teachers have given the following benefits which they got :

| | Frequency |
|---|---|
| 1. Familiarity with modern concept of teaching | 3 |
| 2. Increase in knowledge | 2 |
| 3. Satisfaction | 2 |
| 4. Improvement in Science Teaching | 1 |
| 5. Difficult topics were explained in Summer Institutes in Biology which gives new interpretations & understanding | 1 |
| 6. Refreshes the knowledge | 1 |
| 7. Practical aspects and instructions are explained | 1 |

Ø.

Thus the above statements show that the seminars and conferences add to the knowledge of the teachers and gives new look, understanding and interpretations to the topics which are difficult to explain and the teachers become familiar with the modern concept of biology teaching.

## XIV. Approaches to the Teaching of Biology in Classroom

N.L. Gage says that "teaching is an intriguing, important and complex process, because it is intriguing it attracts scientific attention, because it is complex, research on teaching needs many sided preparation". In our country the teaching method are yet to receive scientific attention.

N.E. Wallen and Robert M.W. Travers clarified the following methods of teaching as per the situations.

1. A teacher teaches as he was taught.
2. A teacher reinforces the behaviour of pupils so as to develop a middle class ideology.
3. A teacher teaches from philosophical traditions. (Rmx Froeble or Rousseau tradition).
4. Teacher teaches through lecture method because he needs to be self assertive.
5. A teacher conducts his classroom in such a way as to produce formal and highly disciplined behaviour because this represents the pattern required by the Principal.
6. Patterns derived from scientific research on learning.

The responses received from biology teachers indicate that they hardly use any variety in the teaching of Biology in their day to day teaching. They do not use and particular method. The various methods used by biology teachers are given below :

| S.No. | Approaches to teaching | Frequency | P.c. |
|---|---|---|---|
| 1. | Demonstration cum Lecture | 13 | 52 |
| 2. | Question and Answer method | 9 | 36 |
| 3. | Teaching by illustrations | 6 | 24 |
| 4. | Creating interest | 3 | 12 |
| 5. | Discovery method | 3 | 12 |
| 6. | Lecture method | 3 | 12 |
| 7. | By illustrating examples from daily life | 3 | 12 |
| 8. | Lab-method or Learning by doing | 2 | 8 |
| 9. | Chalk & Talk method | 2 | 8 |
| 10. | Simple to complex | 2 | 8 |
| 11. | Assignment method | 1 | 4 |
| 12. | On the basis of Previous Knowledge | 1 | 4 |
| 13. | Do it yourself method | 1 | 4 |

It is clear from the above table that biology teacher use various methods of teaching. Lecture cum-demonstration method appears to be the most popular. Their approaches to teaching Biology lack completely the new ferments; Teaching in wider setting, only 12 p.c. of teachers use discovery method, 8% use learning by doing method. The use of heuristic method, historical approach, teaching through individual and group projects and lastly student-teacher planning are completely lacking. This situation can improve only if we improve the average quality of the Teacher through inservice education.

Teaching Aids or Instructional Aids

Proper selection and effective use of Teaching aids motivate students and clarify the concepts of science. Aids should be used skillfully and at the right time. These may range from simple diagrams to films. There utility depends upon proper handling.

The responses of the touches show that about 82 p.c. of the teachers use teaching aids in Biology Teaching whereas 12 p.c. teachers do not use the teaching aid & 4 p.c. gave no response at all. 16 p.c. of the teachers take help from the Regional College of Education, Bhopal for teaching aids. 76 p.c. of the schools do not take any help from Regional College of Education and 8 p.c. gave no response to it.

Reactions of the students to certain statements relating to the teaching-learning process in Biology.

1. About 98 p.c. of the Biology students experience joy while performing Biology practicals.

2. Over 92 p.c. of the Biology students have expressed their views to specialize in Biology.

3. About 90 p.c. of the Biology students have expressed that they feel an enthusiastic to attend Biology class.

4. Nearly 86 p.c. of the Biology students have expressed that any new discovery in Biological field stimulates their thinking too.

5. About 86 p.c. of the students have expressed more liking to Biology than other science subjects.

6. Over 85 p.c. of the students expressed their view to know the reasons of the failure of their experiment.

7. Majority of the students decide on their own in regards the study of the Biology. Their percentages from various schools are convent 92 p.c. central 85 p.c. Demonstration school 82.5 p.c., Govt. Girls school 88 p.c., Govt. Boys school 92 p.c.

8. About 82.5 p.c. of the Biology students feel that their Biology teacher puts too many questions while teaching.

9. Over 76 p.c. of the Biology students have expressed to have more Biology periods.

10. Nearly 76 p.c. of the Biology students expressed their views about Biology subject as least difficult subject.

11. Nearly 75 p.c. of the Biology students expressed to do more Biology practicals than the practicals of other science subjects.

12. Over 72 p.c. of the Biology students have expressed their view that their Biology teacher demonstrate the difficult concept in the class.

13. Majority of the students expressed their views to do practicals in a group of two while performing the difficult one. There percentages ranges from 69 p.c. to 88 p.c.

14. Over 66 p.c. of the Biology students have expressed that the Biology practicals clarifies many of their abstract concepts.

15. Over 62 p.c. of the Biology students have expressed their desire to study Biology in English. The percentage from school to school are convent 100 p.c., Central 100 p.c. Demonstration school 53 p.c., Govt. Girls school 62 p.c. Govt. Boys school 66 p.c.

16. Over 58 p.c. of the Biology students expressed their view that it is easy to guess results in Biology practicals.

17. Many of the students like to do Biology practicals individually. Their percentages of school to school are Convent 58 p.c. Central 87.5 p.c., Demonstration School 53 p.c. Govt. Girls school 82 p.c., Govt.Boys school 88 p.c.

18. About 50 p.c. of the students have expressed that their Biology Laboratory is poorly equipped.

19. Majority of the students expressed that their achievement in Biology is first class. The individual school percentages are Convent 48 p.c. Central 62.5 p.c., Demonstration school 49.5 p.c., Govt. girls school 80 p.c., Govt. Boys school 58 p.c.

20. Over 45 p.c. of Biology students feel that it is easy to score high in Biology. The percentages from school to school are Convent (40 p.c.) Central( 50 p.c.), Demonstration School (36 p.c.) Govt. Girls school(74 p.c.) Govt.Boys School(26 p.c.)

21. Over 34 p.c. of Biology have expressed that they would like to learn Biology in Hindi.

22. Nearly 26 p.c. of students expressed that time is wasted while learning Biology.

23. Over 22.8 p.c. of the Biology students have expressed that biology is very difficult subject as it contains many Technical terms. The percentage from school to school are convent (12 p.c.) Central (20 p.c.), Demonstration School (26 p.c.) Govt. Girls school(28 p.c.) Govt. Boys school(28 p.c.).

24. About 19.8 p.c. of the students have expressed their view that they can learn Biology effectively even without performing any practicals.

25. About 16 p.c. of the Biology have expressed their view about the Biology as a difficult subject.

| S.No. | Statements to which stud nts agreed | A | | B1 | | B2 | | d1 | | d2 | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | F | pc | F | pc | F | pc | F | pc | F | pc | F | pc. |
| 1. | I wish to know reason from Teacher when I fail to perform the expt.successfuly | 45 | 90 | 40 | 100 | 26 | 85.8 | 48 | 96 | 47 | 94 | 206 | 93.6 |
| 2. | I feel over joyed when I discover that my problem has been successfully exptd. | 45 | 90 | 36 | 90 | 28 | 81.5 | 49 | 98 | 46 | 92 | 204 | 92.7 |
| 3. | In case of difficult practical I prefer to do in a group of two than to do it independently | 42 | 84 | 30 | 75 | 24 | 79 | 44 | 88 | 35 | 70 | 175 | 79.7 |
| 4. | New discoveries in Bio. stimulate my thinking when I come to know of them. | 35 | 70 | 29 | 72 | 21 | 69 | 42 | 84 | 43 | 86 | 170 | 77.2 |
| 5. | I would like to learn Bio. in English | 50 | 100 | 40 | 100 | 16 | 53 | 31 | 62 | 33 | 66 | 170 | 77.2 |
| 6. | The Bio-practicals clarifies many abstract concepts | 33 | 66 | 29 | 72.5 | 23 | 75.9 | 42 | 84 | 41 | 82 | 168 | 76.3 |
| 7. | Out of all sc.subjects I like Biology the most | 35 | 70 | 32 | 80 | 19 | 62.7 | 43 | 86 | 37 | 74 | 166 | 75.4 |
| 8. | I prefer to do my Bio-practicals Individually | 29 | 58 | 35 | 87.5 | 16 | 53 | 41 | 82 | 44 | 88 | 165 | 75. |
| 9. | I feel very enthusiastic when I go to attend the Bio. class | 23 | 46 | 24 | 60 | 21 | 69 | 45 | 90 | 39 | 78 | 152 | 69 |
| 10. | I would like to specialize in Bio. | 29 | 58 | 37 | 92.5 | 10 | 33 | 28 | 56 | 37 | 74 | 141 | 64 |
| 11. | Out of all sc.subjects Bio. is the least difficult subject to learn | 32 | 64 | 24 | 60 | 16 | 53 | 39 | 76 | 25 | 50 | 136 | 61.8 |
| 12. | My Achievement in Bio.is generally first class | 24 | 48 | 25 | 62.5 | 15 | 49.5 | 40 | 80 | 29 | 58 | 133 | 60.4 |
| 13. | It is very easy to score very high marks in Bio. | 20 | 40 | 20 | 50 | 11 | 36 | 37 | 74 | 13 | 26 | 101 | 45.9 |
| 14. | I wish the school should have more Bio.periods than other science subjects | 13 | 26 | 17 | 42.5 | 8 | 26.4 | 38 | 26 | 21 | 42 | 97 | 44 |
| 15. | Our Bio.Teacher puts too much questions in class | 28 | 56 | 20 | 50 | 25 | 82.5 | 8 | 16 | 15 | 30 | 96 | 43.6 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16. Our Bio.teacher demonstrates difficult concepts in class. | 22 | 44 | 29 | 72.5 | 11 | 36 | 12 | 24 | 15/30 | 89 | 40.4 |
| 17. I like Bio.practicals more than practicals in physics and chemistry | 13 | 26 | 30 | 75 | 5 | 16.5 | 10 | 20 | 28 | 48 | 82 | 37.2 |
| 18. It is easy to guess exptal. results in Bio. | 10 | 20 | 12 | 30 | 3 | 9.9 | 29 | 58 | 15 | 30 | 69 | 31.3 |
| 19. Our Bio.Lab.is poorly equipped | 2 | 4 | 3 | 7.5 | 3 | 9.9 | 25 | 50 | 22 | 44 | 55 | 25 |
| 20. I find Biology very diffi. subject as it contains too much of technical words | 6 | 12 | 8 | 20 | 8 | 26 | 14 | 28 | 14 | 28 | 50 | 27.2 |
| 21. I can learn Bio.effectively even without preparing expts in the lab. | 9 | 18 | 5 | 12.5 | 6 | 19.8 | 9 | 18 | 7 | 14 | 36 | 16.3 |
| 22. I would like to learn Bio. in Hindi. | x | x | x | x | 5 | 16.5 | 17 | 34 | 11 | 22 | 33 | 15 |
| 23. While learning Bio.I find that time is generally wasted | 1 | 3.3 | x | x | 8 | 26.4 | 12 | 24 | 4 | 8 | 25 | 11.3 |
| 24. I find Bio.is difficult subject | 1 | 3.3 | 5 | 12.5 | 3 | 9.9 | 4 | 8 | 8 | 16 | 21 | 9.5 |
| 25. I study Bio.because my parents insists on it | 4 | 8 | 6 | 15 | 1 | 3.3 | 6 | 12 | 1 | 3.3 | 18 | 8.1 |

| S.No. | Statements to which students disagreed | A | | B1 | | B2 | | C1 | | C2 | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | F | p.c. | F | pc. | F | pc. | F | pc. | F | pc | F | pc. |
| 1. | I study Biology because my parents insist on it | 46 | 92 | 34 | 85 | 25 | 82.5 | 44 | 88 | 46 | 92 | 192 | 87.2 |
| 2. | While learning biology, I find that time is generally wasted | 47 | 95 | 40 | 100 | 20 | 66 | 32 | 64 | 43 | 86 | 182 | 82.7 |
| 3. | I find Bio.is a difficult subject. | 44 | 76 | 32 | 80 | 21 | 69 | 34 | 68 | 36 | 72 | 167 | 75.9 |
| 4. | I can learn bio.effectively even without performing expts.in lab. | 38 | 76 | 35 | 87.5 | 17 | 56 | 38 | 76 | 39 | 78 | 167 | 75.9 |
| 5. | I would like to learn Bio. in Hindi | 50 | 100 | 40 | 100 | 16 | 53 | 29 | 58 | 31 | 62 | 163 | 74 |
| 6. | I find Bio- a very diffi. subject because it contains too mouh of technical words | 43 | 86 | 29 | 72.5 | 17 | 56 | 35 | 70 | 28 | 56 | 152 | 69.1 |
| 7. | Our Bio-lab is poorly equipped | 43 | 86 | 36 | 90 | 26 | 85.8 | 25 | 50 | 21 | 42 | 157 | 68.6 |
| 8. | I like Bio.practicals more than practicals in Phy.Chem | 33 | 60 | 7 | 17.5 | 18 | 59.4 | 32 | 64 | 17 | 34 | 107 | 46.5 |
| 9. | Our Bio.Teacher demonstrates difficult concepts in class | 7 | 14 | 10 | 25 | 16 | 53 | 36 | 72 | 29 | 58 | 98 | 44.5 |
| 10. | Our Bio.Teacher puts too much questions in the class | 19 | 38 | 19 | 47 | 3 | 9.9 | 24 | 48 | 30 | 60 | 95 | 43.5 |
| 11. | I wish the school should have more Bio.periods than other science subjects | 34 | 68 | 18 | 45 | 16 | 53 | 5 | 10 | 19 | 38 | 92 | 41.8 |
| 12. | It is very easy to score very high marks in Bio. | 21 | 42 | 17 | 42.5 | 16 | 53 | 7 | 14 | 27 | 54 | 88 | 40 |
| 13. | It is easy to guess exptl. results in Bio. | 19 | 38 | 22 | 55 | 7 | 23 | 13 | 26 | 21 | 42 | 82 | 37.2 |
| 14. | Out of all Sc.subjects bio.is the least diffi. to learn. | 13 | 26 | 16 | 40 | 7 | 23 | 5 | 10 | 22 | 44 | 63 | 28.6 |
| 15. | I prefer to do my bio. practicals individually | 17 | 34 | 4 | 10 | 12 | 39.6 | 10 | 20 | 5 | 10 | 48 | 21.8 |
| 16. | Out of all the Sc.subjects I like Bio.most | 10 | 20 | 7 | 17 | 10 | 33 | 7 | 14 | 11 | 22 | 45 | 20.4 |

| S.No. | Statements to which students disagreed | A | | B1 | | B2 | | C1 | | C2 | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | F | pc | F | pc | F | pc | F | pc | F | pc | F | pc. |
| 17. | My achievement in Bio. is generally first class | 7 | 14 | 9 | 22.5 | 5 | 16.5 | 6 | 12 | 13 | 28 | 40 | 18.1 |
| 18. | I would like to specialize in Bio. | 17 | 34 | x | x | 10 | 33 | 5 | 10 | 2 | 4 | 34 | 15.4 |
| 19. | I feel very enthusiastic when I go to attend the Bio.class | 15 | 30 | 6 | 15 | 7 | 23 | 2 | 4 | 4 | 8 | 34 | 15.4 |
| 20. | In case of difficult practicals I prefer to do in group of two than to do independently | 8 | 16 | 8 | 20 | 2 | 6.6 | 3 | 6 | 11 | 22 | 32 | 14.5 |
| 21. | I would like to learn Bio.in English | x | x | x | x | 4 | 13.2 | 14 | 28 | 9 | 18 | 27 | 12.2 |
| 22. | The Bio Practicals clarifies abstract concepts | 6 | 12 | 3 | 7.5 | 5 | 16 | 2 | 4 | 6 | 12 | 22 | 10 |
| 23. | New Discoveries in Bio. stimulate my thinking | 6 | 12 | 4 | 10 | 2 | 6.6 | 3 | 6 | 2 | 4 | 17 | 7.7 |
| 24. | I feel over joyed when I discover that my problem has been successfully exptd. | 2 | 4 | 3 | 7.5 | x | x | 1 | 2 | 6 | 2 | 6 | 2.7 |

| S.No. | Statements confused by the students | A F | A pc | B1 F | B1 pc | B2 F | B2 pc | C1 F | C1 pc | C2 F | C2 pc | Total F | Total pc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | I find that biology is a difficult subject | 5 | 10 | 1 | 2.5 | 4 | 13.2 | 12 | 24 | 5 | 10 | 27 | 12.27 |
| 2. | I feel enthusiastic when I go to attend the Bio.class | 10 | 20 | 6 | 15 | x | | 3 | 6 | 7 | 14 | 26 | 11.8 |
| 3. | I wish the school should have more period than other sc. subjects | 3 | 6 | 6 | 15 | 3 | 9.9 | 8 | 16 | 3 | 6 | 23 | 10.4 |
| 4. | The Bio Practicals clarifies many abstract concepts | 9 | 18 | 5 | 12.5x | | | 7 | 14 | 1 | 2 | 22 | 10 |
| 5. | I would like learn Bio. in Hindi | x | x | 1 | 2.5 | 7 | 2.5 | 6 | 12 | 6 | 12 | 20 | 9 |
| 6. | Out of all sc.Bio.is the least difficult to learn | 4 | 8 | 1 | 2.5 | 6 | 19.8 | 7 | 14 | 1 | 2 | 19 | 8.6 |
| 7. | I can learn Bio-effectively even without performing expt.in Lab. | 2 | 4 | 2 | 5 | 6 | 19.8 | 4 | 8 | 3 | 6 | 17 | 7.7 |
| 8. | I find Bio.very difficult subject as it contains technical words | 1 | 2 | 1 | 2.5 | 4 | 13.2 | 2 | 4 | 7 | 14 | 15 | 6.8 |
| 9. | Our Bio.Lab is poorly equipped | 4 | 8 | 1 | 2.5 | x | | 2 | 4 | 6 | 12 | 13 | 5.9 |
| 10. | In case of any difficult practicals I prefer do it independently | x | | 2 | 5 | 2 | 6.6 | 4 | 8 | 4 | 8 | 12 | 5.4 |
| 11. | While learning Bio.I find gen. time is wasted | 2 | 4 | x | | 1 | 3.3 | 6 | 12 | 3 | 6 | 12 | 5.4 |
| 12. | I wish to know reason from Tr. when I fail to do expt.successfully | 4 | 8 | x | | 1 | 3.3 | 2 | 4 | 2 | 4 | 9 | 4 |
| 13. | I feel overjoyed when I discover that my problem has been successfuly exptd. | 2 | 4 | 1 | 2.5 | x | | 4 | 8 | 2 | 4 | 9 | 4 |

| S.No. Statements confused the students | A | | B1 | | B2 | | C1 | | C2 | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F | pc | F | pc | F | pc | F | pc | F | pc | F | pc. |
| 14. Out of all sc. I like Biology most | 5 | 10 | 1 | 2.5 | x | x | x | x | x | x | 8 | 3.6 |
| 15. I prefer to do my bio. practical individually | 3 | 6 | 1 | 2.5 | 1 | 3.3 | x | | 1 | 2 | 6 | 2.7 |
| 16. I study Bio. because my parents insist o-n it | x | | x | | 3 | 9.4 | x | | 3 | 6 | 6 | 2.7 |

Suggestions for Improvement of Biology Teaching

The teachers work with his students as such he must think "How" to teach and "What" to teach. It is fruitless to ask what is more important becuuse both are important. "What" students learn may largely be determined by 'How' it is taught. On the other hand "How" the teacher teaches, especially in Biological science should be determined by "what" they are teaching. The teacher endeavers to gain to a profound understanding of "what" and resourcefulness and skill in 'how'.

In science the "what" and the "How" of teaching are intimately intermingled with each other. Perhaps our most important goal in working with students in science is to help them acquire a better understanding of the various approaches and methods of investigation that are used in the science. However, these understandings can probably only be developed through the demonstration of various approaches and use of the methods that are characteristic of the sciences. This is basically why the methods of teaching science must be consistent with methods of sciences. In other words if science has to be taught effectively it must be certainly, one of the best ways to teach science scientifically is to encourage the students to identify significant questions and problems in science and to work with them as they investigate these problems.

The results of responses received from students as well as teachers regarding making Biology more interesting subject are as follows.

The students were able to offer more suggestions in comparison to teachers. The teachers responses are not much

encouraging. 60 p.c. of the teachers did not care to give any suggestions for the improvement of Biology teaching. Students responses are much encouraging and thesis responses are categorized as follows :

The highest frequency is for the teaching method. The demonstration-cum-lecture method is suggested by majority of the students (N = 66). Then comes the method of teaching through illustration(N = 66) and teaching with the help of coloured diagrams(N = 42). Actually all these three can be grouped together but since the responses were specific these were put as they were. The rest of the methods suggested are shown in the following table.

Table showing the frequency of methods of Teaching

| | A | B1 | B2 | C1 | C2 | Total |
|---|---|---|---|---|---|---|
| Demonstration cum Lecture | 12 | 21 | 6 | 11 | 16 | 66 |
| Taught through Illustration | 2 | 2 | 8 | 22 | 12 | 46 |
| Coloured diagrams | 9 | 1 | x | 22 | 10 | 42 |
| Details of every topic | 1 | 3 | 3 | 2 | 2 | 11 |
| Students should be made inquisitive to acquire knowledge | 1 | 2 | 4 | x | 4 | 11 |
| Individual attention | x | 4 | 1 | x | 5 | 10 |
| Teaching should be as per students understanding | x | x | 7 | 1 | x | 8 |
| Teacher should teach with interest | 1 | 2 | 1 | 1 | 2 | 7 |
| Common examples should be cited | x | x | 2 | 2 | 3 | 7 |
| No speedy covering of course | x | 2 | x | 2 | 3 | 7 |
| Teaching language should be easy | 1 | x | 1 | 1 | 2 | 6 |
| Teaching should be interesting | 2 | x | x | 1 | x | 3 |

| | A | B1 | B2 | C1 | C2 | Total |
|---|---|---|---|---|---|---|
| Teaching through A.V.aids | x | x | 1 | x | 2 | 3 |
| Teaching in Hindi and in English | x | 1 | x | 1 | x | 2 |
| Little portion should be taught in each period | x | x | 2 | x | x | 2 |
| Terms should be explained | x | x | x | 2 | 1 | 3 |
| Difficult topics should be taught through T.V. | x | x | 1 | x | x | 1 |
| Ref. modern researches should be given | 1 | x | x | x | x | 1 |
| Modern methods should be used | x | x | x | x | 1 | 1 |

The responses of teachers for the method of teaching are very discouraging as only 8 p.c. of the teachers stated that teaching should be with the help of Teaching Aids.But the responses given to the earlier questions 52 p.c. of the teachers have also expressed that they use Demonstration-cum-lecture ~~ex~~ method only.

Second suggestion given by the students was about the practicals. It was demanded by many that there should be more practicals (N=51). This was of those who demanded for more practicals, the majority of students are from Convent School and state govt.boys' school(A and C2)

Table showing frequencies of Practicals

| | A | B1 | B2 | C1 | C2 | Total |
|---|---|---|---|---|---|---|
| More practicals | 18 | 5 | x | 7 | 21 | 51 |
| Lab.should be well equipped | x | 5 | x | 7 | 4 | 16 |
| Lab.should content living animals | x | x | 1 | 1 | 1 | 3 |
| More practice for practicals | x | x | 1 | x | 1 | 2 |
| Difficulties of students should be removed | x | x | 1 | x | 1 | 2 |
| Teachers should be present during the practicals | x | x | x | 2 | x | 2 |
| Practicals and theory should go side by side | x | x | x | 1 | x | 1 |

| | A | B1 | B2 | C1 | C2 | Total |
|---|---|---|---|---|---|---|
| Microscopic slides should be explained | x | x | x | 1 | x | 1 |
| Dissecting trays should be issued | x | x | 1 | x | x | 1 |
| Viva should be prepared | x | x | x | x | x1 | 1 |
| Discipline should be maintained | x | x | x | x | 1 | 1 |

Teachers have suggested in reference to practicals that the laboratory should be well equipped and atleast two Biology teachers should supervise the practicals of students (N = 1) Laboratory should be spacious (N = 1).

The next suggestion from student side was about the syllabus. Many students have suggested for shortening of the syllabus.(N = 12). New topics should be included in the syllabus ( N = 7) and only interesting topics should be taught. The rest of the suggestions alog with the frequency is as follows :

Table showing the frequency of suggestions for course or syllabus

| | A | B1 | B2 | C1 | C2 | Total |
|---|---|---|---|---|---|---|
| Course should be shortened | 2 | 1 | 4 | 1 | 4 | 12 |
| New topics should be included | x | x | x | x | 7 | 7 |
| Students interested topics should be taught | x | 1 | 2 | 1 | 2 | 6 |
| Ref. material should be supplied | 2 | 1 | x | x | 1 | 4 |
| Only useful chapters or topics should be taught | x | x | x | x | 3 | 3 |
| Mammals should be given more importance than other animals | 2 | x | x | x | x | 2 |
| Skeletal system should be removed | x | x | x | x2 | x | 2 |
| Botany & zoology should be taught separately (Botany is no use for MBBS) | x | x | x | x | 1 | 1 |
| T.S. of plants & Brain should be removed | x | x | x | x | 1 | 1 |
| Option between Bot.& Zoo.should be given | 1 | x | x | x | x | 1 |

| | A | B1 | B2 | C1 | C2 | Total |
|---|---|---|---|---|---|---|
| Topics concerning our life should be included | x | 1 | x | x | x | 1 |
| Botany course should be reduced | x | x | x | x | 1 | 1 |

4 p.c. of teachers have also suggested for shortening of the present syllabus, 4 p.c. gave their opinion that clear topics should be mentioned. 8 p.c. of teachers suggested that topics which are not available in the books should not be included, and 4 p.c. suggested that diversification of the course should be after XI class.

Regards the teachers students suggested that they need a'good Teacher'. Of those who demanded good teacher majority of students are from Govt. girls school, (N = 16); Central School and Govt. Boys School students have suggested that teacher should be Frank and Broad minded(N = 4). The rest frequencies of suggestions are as follows :-

Table showing the frequencies of suggestions for Teacher

| | A | B1 | B2 | C1 | C2 | Total |
|---|---|---|---|---|---|---|
| Good teacher is needed | x | x | 2 | 12 | 2 | 16 |
| Proper Introduction of topics should be done | x | 1 | 2 | x | 1 | 4 |
| Teacher should be impartial | 1 | 3 | x | x | x | 4 |
| Teacher should be broad minded and Frank | x | 2 | x | x | 2 | 4 |
| Proper understanding between teacher and students | 1 | x | x | x | 2 | 3 |
| Teacher should understand students problem | 2 | x | x | x | 1 | 3 |
| Teacher should be well prepared | ∉1 | x | 1 | x | 1 | 3 |
| Teacher should be nice | 2 | x | x | x | x | 2 |
| Teacher should give question and answer | x | x | 2 | x | x | 2 |
| Discussion in class should be encouraged | 2 | x | x | x | x | 2 |
| Teacher should not put too many questions in the class | x | x | 1 | x | x | 1 |

4 p.c. of teachers have suggested that teachers should be well qualified; 4 p.c. gave their opinion that teacher should be well prepared or should plan for the teaching previously. 4 p.c. stated that teachers should get departmental promotions.

The next suggestion from the students side was that excursions and field trips should be organized in schools (N = 35). As stated previously, it is Biological science which is much benefitted by field trips or field study. Major part of biological science can be effectively studied through field trips only. The very word of Biology means that it should be the study of living things. But since in our Biological laboratories no living organism are available field trips are necessary. 8 p.c. of the teachers also suggested to organize field trips and excursion to places of Biological interest. Few students have also suggested to have Botanical garden in each school; 4 p.c. of teachers also agree to their views. Teachers in addition expressed that if Botanical garden is not in school ~~xxxxxx~~ a visit to any Botanical garden existing in the vicinity of the school should be organized.

Table showing the frequency of exmursions & field trips

| | A | B1 | B2 | C1 | C2 | Total |
|---|---|---|---|---|---|---|
| Field trips should be organized | 16 | 8 | 1 | x | 10 | 35 |
| Botanical garden should be in each school | 3 | x | 1 | x | x | 4 |

More periods for Biology was also suggested by few students (N = 10) and no continuous more than two periods should be in the time table (N = 1). There are few more suggestions given by students for the improvement of Biology teaching which are given below with the frequencies.

1. Examinations should be easy ( N = 5 )

   Short test should be given for practice ( N = 11)

   Passing should be considered by adding the marks of practicals and theory ( N = 2)

   Thsee years course should not be kept for the Board examinations ( N = 2)

2. The Convent students have suggested that teacher should give notes, and also assignments(N = 3). Demonstration school students have suggested that question and answer method should be used by giving answers to each question by the teacher.

3. Library should be well equipped (N = 1)

4. Less number of students should be admitted so that individual attention is possible in the class.

Table showing the frequencies of need for more periods

| | A | B1 | B2 | C1 | C2 | Total |
|---|---|---|---|---|---|---|
| More time should be given for Biology | x | 1 | x | 4 | 5 | 10 |
| No continuous periods more than two | x | 1 | x | x | x | 1 |
| Students should be asked for the choice of the Biology period | x | 1 | x | x | x | 1 |
| Library should be well equipped | x | x | x | x | 1 | 1 |
| Less number of students should be admitted and selection should be made so that individual attention is possible | x | x | x | x | 1 | 1 |

Frequency showing suggestions for examinations

| | | | | | | |
|---|---|---|---|---|---|---|
| Test should be given | 1 | 4 | x | 5 | 1 | 11 |
| Examination should be easy | x | 3 | 1 | 1 | x | 5 |
| 3 years course should not be included for exam. | x | x | x | 3 | x | 3 |
| Passing should be by adding theory and practicals | x | x | x | 2 | x | 2 |

Miscellaneous

4 p.c. of Biology teachers have suggested that Biology subject should be equally teated as physics & chemistry is treated. 4 p.c. gave their opinion that financial aid shoul

be granted as per the strength of the students in each school and not fixed any amount without taking into consideration of the strength of the school. 4 p.c. of teachers have suggested that refreshers course and Biology clubs should be organized.

| | A | B1 | B2 | C1 | C2 | Total |
|---|---|---|---|---|---|---|
| Notes should be given | 3 | 1 | x | x | x | 4 |
| Assignments should be given | 3 | x | x | x | 1 | 4 |
| Question and answer should be given | x | 1 | 2 | x | 1 | 4 |

## Final remarks

The researcher has tried to analyse as objectivity as possible the reaction of teachers and students of biology who took part in this study. That was the reason the researcher herself did not answer to the questionnaire though she is the incharge of a biology lab. Despite this fact the teachers who responded to the questionnaires have already said much which this researcher wanted to say and nothing is left to be added.

This analysis show that the condition of our labs. are far from satisfactory as and much is to be done to improve the condition to achieve the target of effective education.

# CHAPTER IV

## SUMMARY AND CONCLUSIONS

This chapter includes brief summary and conclusions.

### Title of the Study

The status of Biology Teaching and Learning in M.P.

### Introduction

Science teaching in our country is characterized by dullness, drabness and drudgery. The reason is simple. It is generally approached orally except that few demonstrations are thrown in here and there. Students hardly get any opportunities to solve scientific problems experimentally, for whatever they attempt in practicals, it is just to meet the requirements of the Board examinations. It is after independence that, science teaching in India acquired a distinct status at the school stage. But still it can be safely said that the position of science education even to day is not the same through out the country. Also even within the same state, the postion of the science teaching is not the same if one considers different types of schools (Central; NCERT, Board; State Govt.; Private; Rural; and Urban) as well as the physical situations in which they are placed. The problem becomes a bit more serious which in our day today science teaching - learning ignored teachers and their students both in the planning and execution of school science programmes. Lastly it is disheartening to note that

there have been very few studies even of the survey variety so far as the present problem is concerned.

The present study, therefore, attempt to survey the status of biology teaching in some schools of Madhya Pradesh. In its purview it also elicits biology students snap reactions to the learning of this subject.

Aims and Objectives :

The aims and objectives of this study are as follows:-

1. What are the various reasons for taking up Bilogy as an optional subject at the Higher secondary stage ?
2. What are the source of motivation for pursuing this subject at the higher secondary stage ?
3. What opinions are held by Teachers and students in regard to the biology syllabus? More over, what suggestions do they make for imppoving this subject ?
4. Under what conditions does laboratories work take place ?
5. What are the practical difficulties faced by the students while doing practical in the Biology in the Biology laboratories ?
6. What are the various causes of failure in Biology as visualized by Biology teachers and their students ?
7. What are the areas of special interest in students and teachers for their higher education ?

8. What are the various methods and approaches in teaching of Biology employed by biology teachers ? How are individual differences are met.

9. What is the position in regard to school library, allocation of funds, instructial and illustrative materials, work load,internal assessment and evaluation ?

10. What are the personal and professional problems of biology teachers.

11. What suggestions do the biology teachers and their students make for improving the teaching learning process in this subject.

Procedure

The questionnaire approach was used. Two sets of questionnaires were prepared. The first deals with the biology Teachers and second deals with higher secondary of biology. The questionnaires were prepared on the basis of the experience and observation of biology students in class. No special instructions were given as the questions were self-explanatory. The students and the teachers were requested to give their free and candid opinion which, it was promised would be kept confidential. The data outside of Bhopal collected through post. For the local schools, the investigator personally collected the data.

The data thus collected was analyzed and results were formulated in terms of frequencies and percentages.

Sample

The five sub-samples of the students were taken from five types of schools of Bhopal. These schools were categorized as 'A' for Convent School(Private); 'B1' for Central School; 'B2' for Demonstration Multipurpose higher secondary school, attached to RCE Bhopal 'C1' for Govt. girls higher secondary school; and 'C2' for Govt. Boys' Higher Secondary School.

| S.No. | Type of School | No.of students | Categories |
|---|---|---|---|
| 1. | Convent | 50 | 'A' |
| 2. | Central | 40 | 'B1' |
| 3. | Demonstration | 30 | 'B2' |
| 4. | Govt. Girls | 50 | 'C1' |
| 5. | Govt.Boys | 50 | 'C2' |
| Total | N = 5 | N=220 | |

Only twentyfive teachers (M = 13, F = 12) responded to the questionnaire. Out of these 12 were in their twenties, 11 in their thirties and the remaining two in their forties. Their teaching experience was quite variable: 1 - 5 year(N=7); 6-10 years( N = 11); 11-15 years (N = 4); 16 - 20 years (N=3). About 50 p.c. of them were trained post graduates, 20 p.c. only post graduates in Biological Science. 16 p.c. were trained graduates. The remaining were post graduate in other subject (M.Sc.Chem N = 1, M.A.B.Sc.B.Ed. N=1, M.Sc.M.Ed.N=1).

In addition to biology, they taught other subjects as well : Chemistry ( N = 12); Gen. Science(N = 10); Physics(N=2);

Ele. Biology (N-2); Maths(N=2); Craft (N=1); Moral Science (N=1); Home Science(N = 1); Hand writing (N==1).

Description of the Questionnaire

The questionnaires covered the following areas. Aims and objectives of biology teaching, both theory and practicals and extent to which realized, the laboratory work, suitability of the curriculum and suggestions for its modifications if any; method of evaluation and effectiveness of internal assessment, provision for instructional and illustrative material, approaches in teaching biology and difficulties encountered in teaching biology, causes of failure in biology; professional problems of biology teachers, reasons for choosing the study of biology by students, motivation secured for an optional subject, areas of their interest in the subject etc.

Table No.

Table showing Analysis of the Questionnaires

| S.No. | Areas covered through the Questions | Teachers S.No.of concerned question | Students S.No.of concerned question. | Total |
|---|---|---|---|---|
| 1. | Reasons for offering Biology | - | 1 | 1 |
| 2. | Motivation for offering Biology | - | 2 | 1 |
| 3. | Self Learning of Biology | - | 3 | 1 |
| 4. | Aims and objectives of Biology teaching and practicals | 1,2,7,8 | - | 4 |

Contd.

| S.No. | Areas covered through the Questions | Teachers S.No.of concerned question | Students S.No.of concerned question | Total |
|---|---|---|---|---|
| 5. | Laboratory work | | | |
| | a) Time for preparing practicals | 5 | | 1 |
| | b) Separate bio-laboratory | 9 | | 1 |
| | c) Dimentions, furnishing and equipping of the Biology-Lab. | 10,11,12 | | 3 |
| | d) Conditions under which students perform practicals | 14,14,16 | | 3 |
| | e) Laboratory assistants | 17,18 | | 2 |
| | f) Problems while doing the practicals | 3,19 | 8 | 3 |
| | g) Suggestions to overcome difficulties of practicals | 6,20 | | 2 |
| | h) funds and loans for Biology including purchases of Scientific material | 55,56 | | 2 |
| | | 21,22,23 | | 3 |
| | i) Facilities for Biology practicals | 27,28,34 | | 3 |
| | | | | (26) |
| | Biology Syllabus | | | |
| | a) Basis of Biology in middle classes | 40 | 4,5,6 | 4 |
| | b) What should be added ? | 41 | | 1 |
| | c) What should be deleted | 42 | | 1 |
| | | | | (6) |
| 6. | Causes of Failure in Bilogy | 48 | 7 | 2 |
| 7. | Creating Scientific Interest | | | |
| | a) Field trips and No.of visits | 31,32 | | 2 |
| | b) Visit to Botanical garden | 33 | | 1 |
| | c) Collection work | 35 | | 1 |
| | d) Participation in science fairs and exhibition | 36,37,38,39 | | 4 |
| | | | | (8) |

| S.No. | Areas covered through the QUESTIONS | Teachers S.No.of concerned questions | Students S.No.of concerned question | Total |
|---|---|---|---|---|
| 9. | Evaluation in Biology | | | |
| | (a) Method of Internal-assessment | 43 | | 1 |
| | (b) Difficulties | 44 | | 1 |
| | (c) Ways for improvement | 45 | | 1 |
| | (d) Procedure of evaluation in local exams & others | 46,47 | | 2 |
| | | | | (5) |
| 10. | School Library | 50,51,52, 53,54,57, 58. | | 7 |
| 11. | Measures to help gifted Average, slow learners | 49 | 9,3 | 3 |
| 12. | Problems | | | |
| | a) Academic, personal | 59 | | 1 |
| | b) Professional | 60,61 | | 2 |
| | c) Ways to Solve | 4 | | 1 |
| | | | | (4) |
| 13. | Academic Growth | 62,63,64, 65,66,67, 68,69. | | 8 |
| 14. | Approaches in Teaching | 70,& 71 | | 2 |
| | Teaching aids | 29,30 | | 2 |
| 15. | Reactions of students to the 25 statements | | 1 to 25 | 1 |
| 16. | Suggestions for improvement of Biology teaching | 72 | 10 | 2 |
| | | | | 82+1 |

The questionnaire meant for Biology students were prepared in two parts. First part contained ten open ended questions, eliciting their personal opinions and suggestions. The second part of the questionnaire sought their reactions to 25 statements on three point scale, agree, do not know, and disagree. The statements covered the areas of Biology as seen by the students as laboratory work, medium of instructions, teaching of biology etc. To these 25 statements, students have to give their immediate reactions without spending too much time on any statement. If they agree to the statement they had to write 'A' against the statement, if they disagree, they had to write 'D' and if they are not able to decide or confused they had to put question mark(?) against the statement.

Handling of the Data

Analysis of Teachers and Students questionnaire was done and common questions aiming at the similar information were put together to simplify the report.

All the responses except those were considered, irrelevant, vague, mixed and hence difficult to classify, were tabulated, categorized and interpreted. Every care was taken to count each and every response, though it was very difficult to tabulate all the responses received through open ended questions; which attracted large number of responses. The questions related to a particular area of teaching Biology were grouped together to facilitate interpretations of the data. It may be further mentioned that quality of responses

received has also given due consideration and therefore, a quality response given only by one of the respondents has also been included. The results of the questionnaires were formulated in the terms frequencies and percentages.

Main Findings

The results of the study indicated

1. Reasons for offering Biology :

In regard to the motives underlying the choice of biology as a subject for study at higher secondary stage, majority of the students expressed their views that factors like better job prospects, curiosity and the desire for the ascertainment of truth and look for the new and novel by doing some service to mankind have weighed with them for the choice of Biology as a course of their study.

The finding shows that 84.54 p.c. of students were motivated to pursue biological course of study as they would succeed in medical profession and that the opportunities for their employment would be greater. About 47.27 p.c. of the students have curiosity and anxiety for the ascertainment of truth and discovery of living things and nature. 26.36 p.c. of the students wished to make biology as a carrier and 25.9 p.c. wished to make a significant contribution to the field of science by serving mankind through medical profession and their main aim is to make a significant research, which would bring them recognition in their profession. 21 p.c. were interested in the subject from the beginning and also had liking to it. About 20 p.c. of students aimed at

knowing about the human phenomenon. Nearly 18.6 p.c. of students did not have any other choice for their study. To them circumstances gave no other option. In addition to these responses a few others gave the following additional reasons for taking up Biology.

1. To secure good job - 10.9 p.c.
2. Interest in practical work 7.27 p.c.
3. Good achievement 5.9 p.c.

2. Sources of Motivation for offering Biology.

For the choice of the subject of study, students gave a number of factors, like aspirations from friends, parents, modern scientific development teachers and relatives. But analysis of the data reveals that about 85.9 p.c. of students were self motivated for pursuing the study of biology and 79. p.c. of have been encouraged by the parents. This analysis of data shows more than 79 p.c. of students have been self-motivated to take up the subject for higher secondary as an optional than the percentage of the students bound by parental ideals alone. This finding may be reflective of a desire on the part of the students to appear as self made men.

3. Self Learning

Nearly 46.4 p.c. of students expressed that they do can do the self learning of biology. But 44 p.c. of students have expressed that they can not study biology without teachers help and guidance. The frequencies of the individual school

shows that nearly 62 p.c. of convent school students have given negative responses and only 34 p.c. responded positively, whereas other school frequencies show that nearly 50 p.c. or little more than 50 p.c. of the students have expressed to study biology on their own or without teachers help (Central 50 p.c., Demonstration School 5 p.c., Govt.girls school 52 p.c., Govt. Boys school 58. p.c.). This finding also shows that our schools do not encourage the habit of "Spoon feeding" except convent schools.

4. Aims and objectives of Biology teaching and learning :

As per about 76 p.c. of the responses the main aim of Biology Teaching learning is to understand the impact of biology on our own way of life, to develop ability to judge truth and false to understand the process of heredity and evolution. As per 48 p.c. responses the main aim was to create scientific appreciation, which includes, to introduce students to life of scientists, to develop hygien habit, to produce more clothing and food, to help students to help to understand the economic importance of plants and animals, to protect wild life etc. 60 p.c. of the responses stated that their aim was to develop scientific skills which includes exploring the wonders of nature; developing systematic procedure and skills for attacking problems experimentally.

As per 72 p.c. responses, the objective was to create interest in plants and animals to know about nature; use of plants and animals in welfare of man.

Nearly 50 p.c. of the responses were to create interest

in natural phenomenon; to create interest in science hobbies, to seek good profession, especially medical profession, to prepare good science scholars; to uplift the dignity of labour and to prepare good citizens etc.

Aims and Objectives of performing Biology Practicals

As regards the aims and objectives of practical work, they stated to develop observation skill in their students (28 p.c. ) to develop skill in handling the apparatus(28 p.c.) to develop skill in drawing (20 p.c.) to develop skill in dissection (32.p.c. )

As per 40 p.c. responses was to create scientific attitude which includes to develop stimulate thinking, rational thinking, 32 p.c. of responses aimed at to create functional understanding in students to create scientific interest 80 p.c. to create scientific appreciation 12 p.c. and to pass examination 5 p.c.

V. Some Aspects about Laboratory work :

Five teachers omitted this question. Two schools have common laboratories for physics, chemistry and Biology. The resp of the schools have different sizes of biology laboratories, as 40' x 20' ( 5 schools) 60' x 30' (2 schools) and 20 x 10 (2 schools). Other sizes in case of the remaining 45 p.c. were 24' x 16', 18' x 18', 24' x 20', 35' x 15', 45' x 30', 25' x 15' 15' x 12' and 30' x 20'.

As regards the furnishing of the biology laboratory majority of the schools have to face many handicaps. As there is shortage of dissection tables as a result of which as many

as 30 students work on one table in several schools. THere is shortage of space, not only this but some schools do not have a separate biology laboratory even. Proper or adequate number of teachers, supervisors and Laboratory assistants are also not provided by many schools.

Over 50 p.c. of the schools have only one section of Biology. Each section containing 13 to 95 students. This data also shows that we have schools of all types namely large schools with 4 sections medium schools with 1 to 2 or 3 sections and small capacity school having only one section. Further it has been found that the main factor affecting the quality of practical work in Biology are : limited space, single teacher with no supporting help for supervision, the work load, lack of trained laboratory assistant, lack of funds etc. About 84 p.c. of biology teachers have seported that they do not have laboratory assistant, and 16 p.c. have common laboratory assistant for physics, chemistry and Biology, 4 p.c. have separate laboratory assistant for biology. Nearly 48 p.c. to 50 p.c. have stated that they have lack of funds for the purchases of the laboratory material, 80 p.c. of schools are not permitted to do the direct purchases. They have to submit the list to the head office 8 p.c. have to supply of material through D.S.E. 8 p.c. have to do purchases by charging science fees(private schools) and 4 p.c. get official list of material.

VI. Syllabus

As regards the syllabus, teachers do not have any say in the matters of prescribing course of study. But they have

given a number of suggestions for adding and deleting topics from the present syllabus. They have also suggested that there should be sufficient flexibility in gradation of the topics. 56 p.c. of the biology teachers have expressed that none should be deleted. Four out of 25 teachers suggested to delete the topics of Balance of nature, ecosystem, Families, snakes, R.N.A. and D.N.A. Students also gave several suggestions for the modifications of the present syllabus. This shows their awareness and interest in biology beyond the classroom learning in this subject.

VII. Causes of Failure :

The causes of failure of students are many fold. In their responses teachers expressed that very low percentage of students fail in Biology. But students gave many causes and the main emphasis was given to the following.

a) No interest 72.7 p.c.

b) No regular study habit 39.5 p.c.

c) Choice of optional is forced 34.5 p.c.

d) No proper drawing skill 38.6 p.c.

e) No good teacher 29.3 p.c.

f) Economic status of students 21.8 p.c.

g) No proper facility available 16.3 p.c.

VIII. Creating Scientific Interest :

In regard to creating scientific interest in students 56 p.c. of the teachers have stated that they organize biology field trips or excursion once or twice a year only 36 p.c. of schools have botanical gardens, whereas 60 p.c.

of schools do not have any garden. 52 p.c. of the schools have provision of bilogy museum and 44 p.c. have no biology museum in their schools. 4 p.c. of teachers gave no response. 60 p.c. of the schools take part in Science fairs, of which 12 p.c. of schools take part at district level 12 pc at divisional level, 8 p.c. take part at state level and only 4 p.c. take part in science fairs at National levels. 60 p.c. of the schools participate in science exhibition at state level, 30 p.c. to 40 p.c. of the schools organize science exhibition at school level only.The rest of schools do not organize any science exhibition at all.

IX. Evaluation

Evaluation system in our schools should be modified. Neady 52 p.c. of teachers have suggested to have internal assessment in addition to annuals and terminals, which should be done on the basis of overall assessment of the students. One of the biology teacher have suggested that 30 p.c., 20 p.c. and 50 p.c. of terminal, half yearly, and Annual examinations should be calculated and passing should be on 40 p.c. of the total.

X. Library

64 p.c. of the biology teachers have stated the non-availability of adequate library facilities in their schools affects the teaching of biology. 28 p.c. have well equipped library and only 12 p.c. have departmental library.

XI. Individual differences:

Measures to meet the individual differences in students

are not and cannot be met in our class rooms. The reason is being that the classes are over crowded, much rigidity and informity in Biology syllabus and teaching method is the same to all pupils regardless of their age, ability, aptitude and needs. But several teachers (32 p.c.) try hard to meet them in various ways. But 60 p.c. of teachers are helpless to do.

XII. Problems

Biology teachers have been careful not to mention their personal problems. However, a few indicated their professional problems as : over crowdedness in classroom (12 p.c.); interference of unconcerned teachers (4 p.c.) shortage of time, unable to pay individual attention (8 p.c.); too much of work load (4 p.c.); residential accommodation (4 p.c).

Regards more professional problems they have mentioned that non-availability of adequate laboratory and library facilities (12 p.c.); non-cooperative motives of Headmaster and collegue (12 p.c.); over crowded and imbalance classes (8 p.c.); ever poor standard of students (8 p.c.); and lack of recognition in the society (4 p.c.); are major professional problems.

XIII. Academic Growth :

Further analysis shows that nearly 36 p.c. to 40 p.c. of biology teachers have attended the various biological seminars; summer institutes, and conferences. But 40 p.c. have not attended these institutes, and conferences. Rest

and 24 p.c. have not responded to this. Those who have attended these conferences and institutes are benefitted in various ways as it adds to the knowledge and gave new look in understanding and interpreting the topics. A major benefit is in becoming familiar with the modern concept in biology. It is necessary to arrange inservice education programmes for those who have not participated in these institutes & conferences.

XIV. Approaches to Teaching & Teaching Aids

In regard to the approaches in teaching; it has been found that biology teacher uses various methods of teaching. But the main emphasis was given to use of Demonstration-cum-lecture method (52 p.c.); Question-Answer method (36 p.c.). Their approaches lack completely new ferments of teaching in wider setting. Only 12 p.c. of biology teachers use discovery method and learning by doing method. 82 p.c. use teaching aimds in classroom for teaching biology and 16 p.c. take help and guidance from RCE Bhopal for teaching aids.

XV. Reactions of the students to certain statements relating to the Teaching learning process in Biology.

1. About 98 p.c. of the Biology students experience joy while performing Biology practicals.
2. Over 92 p.c. of the Biology students have expressed their views to specialize in Biology.
3. About 90 p.c. of the Biology students have expressed that they feel enthusiastic to attend Biology class.

4. Nearly 86 p.c. of the Biology students have expressed that any new discovery in Biological field stimulates their thinking too.
5. About 86 p.c. of the students have expressed more liking to Biology than other science subjects.
6. Over 85 p.c. of the students expressed their view to know the seasons of the failure of their experiment.
7. Majority of the students decide on their own in regards the study of the Biology. Their percentages from various schools are convent 92 p.c., central 85 p.c., Demonstration school 82.5 p.c., Govt. Girls school 88 p.c., Govt. Boys School 92 p.c.
8. About 82.5 p.c. of the Biology students feel that their Biology Teacher puts too-many questions while teaching.
9. Over 76 p.c. of the Biology students have expressed to have more Biology periods.
10. Nearly 76 p.c. of the Biology students expressed their views about Biology subject as least difficult subject.
11. Nearly 75 p.c. of the Biology students expressed to do more Biology practicals than the practicals of other science subjects.
12. Over 72 p.c. of the Biology students have expressed their view that their Biology teacher demonstrate the difficult concept in the class.
13. Majority of the students expressed their views to do practicals in a group of two while performing the difficult one. Their percentages ranges from 69 p.c. to 88 p.c.

14. Over 66 p.c. of the Biology students have expressed that the Biology practicals clarifies many of their abstract concepts.
15. Over 62 p.c. of the Biology students have expressed their desire to study Biology in English. The percentage from school to school are convent 100 p.c., Central 100 p.c. Demonstration school 53 p.c., Govt. Girls school 62 p.c., Govt. Boys School 66 p.c.
16. Over 58 p.c. of the Biology students expressed their view that it is easy to guess results in Biology practicals.
17. Many of the students like to do Biology practicals individually. Their percentages of school to school are convent 58 p.c., central 87.5 p.c., Demonstration School 53 p.c., Govt. Girls school 82 p.c., Govt. Boys School 88 p.c.
18. About 50 p.c. of the students have expressed that their Biology Laboratory is poorly equipped.
19. Majority of the students expressed that their achievement in Biology is first class. The individual school percentages are convent 48 p.c.,Central 62.5 p.c., Demonstration School 49.5 p.c., Govt. Girls School 80 p.c., Govt.Boys School 58 p.c.
20. Over 45 p.c. of Biology students feel that it is easy to score high in Biology. The percentages from school to school are convent (40 p.c.), Central (50 p.c.), Demonstration School (36 p.c.) Govt.Girls School (74 p.c.), Govt. Boys School (28 p.c.).

21. Over 34% of Biology have expressed that they would like to learn Biology in Hindi.
22. Nearly 26 p.c. of students expressed that time is wasted while learning Biology.
23. Over 22.8 p.c. of the Biology students have expressed that biology is very difficult subject as it contains many technical terms. The percentage from school to school are Convent (12 p.c.), Central (20 p.c.), Demonstration School (26 p.c.), Govt. Girls School (28 p.c.), Govt. Boys School (28 pc.)
24. About 19.8 p.c. of the students have expressed their views that they can learn Biology effectively even without performing any practicals.
25. About 16 p.c. of the Biology students have expressed their view about the biology as a difficult subject.

XVI. Suggestions

Main suggestions have come from students and teachers side for the improvement of biology teaching and making it an interesting subject as follows :

50 p.c. of the biology students and 52 p.c. of the biology teachers have suggested for use of Demonstration cum-lecture method. A greater number of students (N = 51) have suggested for more practicals in biology. Teachers have suggested that biology laboratory should be spacious, adequately equipped and at least two teachers should be present at the time of practical work for supervision (N=6).

5.49 p.c. of students and 4 p.c. of teachers have suggested for reducing the bulk of syllabus. 4 p.c. and 8 p.c. of the teachers suggested respectively that topics should be clearly stated and topics which are not available in the books should not be included in the syllabus. 4 p.c. of the teachers gave their opinion that diversification of the course should be after the XI class.

Nearly 32 p.c. of the Govt. Girls School have demanded good teachers. Central school and govt.Boys school students have suggested that biology teacher should be frank and have wider outlook on life. 4 p.c. Teachers have suggested that the teachers should be well prepared for their classes. 4 p.c. of them have suggested for departmental promotions.

8 p.c. of the teachers have suggested the organization of field trips and excursions to places of biological interest. A greater number of students favour it (N = 35). Further both teachers and students have suggested to have Botanical garden in every school.

Miscellaneous

A few more suggestions have come from students which are given below :

1. More periods but not continuous periods should be arranged in time-table.

2. Library should be well equipped.

3. Less number of students should be admitted to facilitate individual attention.

4. Examination should be modified, frequent short test should be given, passing should be by adding practical and theory marks.

5. Convent school students & Demonstration School students have suggested that notes and question answers should be dictated by the teachers and more assignments should be given.

6. Biology teachers have suggested that Biology subject should be treated equally with other science subjects.

7. Few teachers gave their opinion that financial aid should be granted as per the strength of the students in each school, and few suggested to organize biological cubs and refreshers courses.

## CONCLUSIONS

The results of this study indicate :-

1. Majority of students offer biology as a subject of study for better prospects.
2. 85 p.c. students choose biology at their own will.
3. Other major cause for offering biology by students is the encouragement and suggestions by parents.
4. Lesser number of boys offer biology at the advice of school authorities and teachers.
5. Difficulty in performing biology practicals in schools arise due to shortage of funds and materials.
6. Biology practicals do not fulfil the required aim due to lack of space in labs. and shortage of teachers.

7. With a view to creating scientific interest in students many teachers arrange biology field trips, excursions and visit to botanical gardens. 60 p.c. schools take part in science fairs and exhibitions organised at district, State and National level.
8. Teachers are aware of the explosion of knowledge in the field of biology and therefore suggest deletion of some topics and addition of some others.
9. Teachers suggested for modifying evaluation system. They suggested that in addition to written terminal and annual examinations, the internal evaluation system should also be introduced.
10. Non-availability of Library facility in schools for students and teachers affect adversely the teaching of biology.
11. The percentage of failure in biology is low. Some of the causes for failure are as follows :

    a) No regular study habit
    b) No skill in drawing
    c) choice of option is forced
    d) personal problems
    e) The teacher was not qualified
    f) Over crowding of classrooms
    g) Lack of proper facilities in schools.

12. The time table is not prepared with a view to take care of individual difference in students.

13. Some of the professional problems of teachers are as follows :

    a) Non-availability of adequate laboratory or Library facilities.

    b) Non-Cooperative motives of the Headmaster/Principal and colleagues.

    c) Over crowded and imbalance classes.

    d) Lack of recognition

    e) Poor standard of students

14. Many teachers have attended subject seminars and were benefitted by them.

15. Majority of teachers use demonstration-cum-lecture method in teaching biology.

## Limitations of this Study

1. The first limitation of the study is that relationship between achievement in biology and facilities for biology teaching could not be correlated.

2. Second limitation is that the classroom behaviour of the biology teacher could not be studied.

3. The individual status of biology in relation to other science subjects could not be determined.

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## Recommendations for improving the status of biology teaching and learning

Since the aim and objective of this study was to probe into the conditions prevailing as far as teaching and learning of biology is concerned, it is proper to recommend some measures that this researcher felt during this study to improve the existing conditions:

(1) Properly qualified and trained persons who are devoted to teaching profession should only be appointed to work as Biology teachers.

(2) Those of the teachers who are untrained should be deputed for training.

(3) The physical facilities of biology labs. should be improved.

(4) The Biology teachers should be given complete academic freedom.

(5) Admission policy should be strict so that those of the students who do not have aptitude of learning biology are stopped from offering biology.

(6) Discussions and meeting of biology teachers should be generally organised so that their living contact with the subject is not broken.

(7) Extension service departments of Training colleges should be strengthened.

(8) Biology teachers should be deputed to attend various seminars and conferences.

(9) State Institutes of Science Education should be strengthened.

(10) Science education centres should be established at selected places in the country. Here problems relating to science teaching and education should be worked out.

If these recommendations are accepted and implemented the researcher sincerely hopes that the existing conditions can improve to transport biology teaching and learning in a congenial world.

Appendix A

Dear colleague,

As a part of my M. Ed. work I am writing a dissertation on the THE STATUS OF SCHOOL BIOLOGY as seen by biology Teachers and the students For this purpose I have prepared two questionaires, one addressed to the teachers and the other to selected groups of biology students studying in class XI In these questionaires I have raised several questions relating to the teaching of biology These questions relate to the aims and objectives of biology, organization of laboratory work, evaluation etc I would like to have your considered juedgements, opinions and feelings on the various questions raised in the questionaires I am sure that on consolidation, it will be possible to picture the status of biology teaching as it goes on in our schools, on the basis of empirical evidence. You have been engaged in the task of biology teaching over the years Your valuable opinions would help me a lot in not only completing my work but also to find out the status of biology as one of the school subjects.

This questionaire is easy to fill in Many questions are of yes/No type. There are some questions which require short answers In such cases, please number your ideas serially This will help me in categorizing your responses objectively. In few others, you are also to comment on the particular school practice/organization Some questions require factual information Kindly supply that information in the spaces provided

Thanking you

Miss M. D. Shukla
M Ed. Student

P N The information given in questionaire would be kept strictly confidential and would be used only for Research Purpose

OBJECTIVES

1. In your opinion, what are the first five most important objectives of Biology Teaching in Higher secondary school.

1.

2.

3.

4.

5.

2. Please mention whether you are able to fulfil the above mentioned five objectives? Against each of the above mentioned objectives write down (a) If it is being fully realized (b) If it is partially realized, (c) If it is not benig realized at all.

1 2 3 4 5

3 Please mention the difficulties which the students face in learning Biology

4. How do you meet the academic difficulties and problems?

5. Do you get sufficient time to prepare for the conduct of practicals?

Yes / No

6. If not, how do you arrange for the same?

LABORATOR WORK :

7. Please mention five main objectives of the Laboratory work at the higher secondary school in Biology?

1.

2

3.

4.

5

8. Please mention whether you are able to fulfil the above mentioned five objectives? Against each of the above mentioned objectives write down- (a) if it is being fully realized, (b) if it is partially realized, (c) if it is not being realized at all.

1 2 3 4 5

9. Do you have separate Biology Laboratory in your school?

Yes / No

10 Is your laboratory is well equipped?

Yes / No

11. What are the Dimentions of your Biology Laboratory ?

(a) Length.
(b) Breadth.

12. Please give the number of Dissecting tables available in the Biology - laboratory.

No———

No. of Students working on each table.

13) Please mention the strengh of students offering Biology for the last three years.

| | 1970 – 71 | 1971 – 72 | 1972 – 73 |
|---|---|---|---|
| Class I X | | | |
| Class X | | | |
| Class X I | | | |

14) Do the students get opportuinity to perform the practicals individually.

Yes / No

15) Give the conditions under which Biology practicals are performed by the students.

| | BIOLOGY | | |
|---|---|---|---|
| | XI | X | XI |
| a) Number of groups in which the class is divided to work at a time in the Laboratory. | | | |
| b) Number of students in one group that actually work at a time in the Laboratory. | | | |
| c) Number of periods allotted to each practical group per week | | | |
| d) Number of teachers who supervise the work of the group | | | |
| e) Whether experiments are usually performed individually or in batches of 2, 3, 4, or 5 | | | |

16) If you do not have seperate Biology Lab in your school, how do you manage tc complete the practicals as prescribed in the syllabus ?

17) Do you have trained Laboratory attendant ?

Yes / No

18) Do you have laboratory assistants seperate for each Laboratory (Phy Chem. Bio.) ?

Yes / No.

19) What different problems do you face while conducting the practicals in the Laboratory ?

1.

2.

3

4

5.

20) Kindly give your suggestions to over - come your difficulties in conducting the practical work ? Please mention your Suggestions.

21) How much grant per year do you get for the Biology Laboratory ?

22) Is that amount sufficient ?

Yes / No

23) How much additional grant per annum is otherwise necessan ?

24 What is the procedure for the purchases of the scientific equipment for Biology laboratory ?

(a) Whether official list is provided

or

You have to give required list to the Head office

(b) Any other Method

25. If the official lists is provided, does it satisfy your requirement ?

Yes / No

26 If not, what alternate arrangement is made for the fulfilment of the requirement?

kindly give details

27 Do you have froggary in your school?

Yes / No

28. Do you have provision for preserving dissected frogs?

Yes / No.

29 Do you use teaching aid in teaching Biology?

Yes / No

30 Do your ever seek help from Regional college of education, Bhopal or state Institute of Education in getting instructional aid and A V aids (Models, over head projectors, slides, films)?

Yes / No

31. Do you take your students for field trips?

Yes / No

32 If yes, kindly mention the number of trips per year.

33 Do you take your students to visit Botanical gardens?

Yes / No.

34. Do you have Biological Museum in your School?

Yes / No.

35. Do you encourage the students to collect Biological specimen, identify them and preserve to build your own Biological Museum in your Biology Laboratory?

Yes / No.

36 Do you participate in science Fairs?

Yes / No

37 If 'Yes', in what way?

38. Do you participate in science exhibition organized by the state government?

Yes / No

39. Do you organize science exhibition in your school ?

Yes / No

SYLLABUS

40. Do you think that the present syllabus in General Science for the Middle Classes (VI, VII, VIII) is effective enough for preparing students to make a choice as an optronal in IXth grade?

41. In your opinion what new topics should be added to the present Syllabus of Biology for IX, X, & XI Clauses?

42 In your opinion what topics should be deleted from the biology Syallabus of the IX, X, & XI Classes?

EVALUATION

43. How do you assess your students for the Internal assessment? Please tick

1. Day to day work in the class
2 On the basis of Internal examinations
3. On the basis of practical records
4 Over all performance

} Select one of thesen

44. Kindly mention the difficulties you face in internal assessment.

45. Kindly suggest ways to improve Internal Assessment

46 What is the preocedure of evaluation the students performance of class IXth and Xth in your school?

(a) Monthly test and Annual.
(b) Three Terminals and Annual
(c) Any other evaluation process.

47. What is the Percentage of pass students in Biology subject in Board Exam. Kindly mention three years datails.

| Year | No. of students Apper. | No of Studs Pass | % of Stds. Pass | Div in Biology |
|---|---|---|---|---|
| 1970—71 | | | | |
| 1971—72 | | | | |
| 1972—73 | | | | |

48. Kindly mention the causes of Failure of students in Biology

52 Do you have a Departmental Library ?

Yes/No

53. Which periodicals are subscribed by the school library for the benefit of science students? Please give these details

| S. No | Name of the Journal | Publications | Version |
|---|---|---|---|

54. How do you get books of your choice or new book in your Library ?

1

2.

3

4

5

MISCELLANEOUS

55. What are the sources of Financial Aid to your school?

1. Central Govt.
2. D. P. I.
3. Private Agency.

56. What is the total amount your school receives per annum?/contingency

57. Apart from your Library, do you have any other facility near by for the extensive reading for you and your students?

Yes/No.

58 If yes kindly give details of the agency providing this facility.

PROBLEMS:

59. Are you give the class according to your qualification or according to your designation ?

60. What are your personal and professional problems?

PERSONAL PROBLEMS

Proaessionl probles

61. There are many situations, personal and professional which irritate you and affect the quality of your teaching. Kindly give the exchaustive list of all such situations preferably in order of most irritating to less irritating situation.

62. Kindly mention your special areas of interest in Biology and science Education.

1

2.

3

4

5

63. Have you done any Research work (publis hed or un published) in Biology ncluding your M Sc. work? Kindly give details.

64. Have you published any article connected with your subject, educational topic or science education ? Please give details.

65. Are you a member of any professional organisation? If so, please mention the name of the organisation.

66. How does the organization help you in your professional growth?

67. Do you have any chance of further promotion in your job?
Yes / No.

68. Have you attended any refreshers course in Biology or Science Teaching? Please give details.

69. If yes, to what extent were you benefitted by these refreshers courses?

70. How do you generally approach the teaching of your subject in the class room?

71. What activities do you have out side the class for developing scientific interests amongst your students ?

72. Any other suggestions/remarks for the improvement of biology.

1. Why did you take up biology at the higher secondary stage ? Give first five main reasons ?

   1

   2.

   3

   4.

   5

2 Who advised you to take up biology at the higher secondary stage ?

   1.

   2.

   3.

3. If given the opportunity, can you study most of biology without teachers help ? Yes / No.

4 What topics apeal to you most in biology ? Please write the topics only.

   1.

   2.

   3.

   4.

5. What topics appeal to you least in Biology ? · Please write the topics only

6. What topics (or part of the topics) are very easy which you can learn without securing any body's help ?

7. Some students fail in biology, why ? give atleast five main teasons?

1.

2.

3.

4.

5.

8. What difficulties do you experience during practicals in the class ? Mention the first five main difficulties.

1.

2.

3.

4.

5.

9. If given the chance and the facilities, what specific problems in biology would you like to investigate on your own, with little guidance from the teacher. Write at least three problems.

1.

2.

3

10. What suggestions would you make for making biology an interesting and stimulating subject give atleast three suggestions

1

2.

3.

I am writing below some statements. Read them carefully. Give your immediate reactions without spending too much time on any one of the questions. If you agree with the statement, write A. If you disagree with the statement; write D. If you cannot make up your mind, then write ?

EXAMPLE:

In comparison to other science subjects, I like biology very much. A.

If you agree, write A opposite to it.

If you disagree, write D opposite to it.

If you do not know, write question mark ? You are to write only one of the symbols.

1) I feel very enthusiastic when I go to attend the biology class. ( )

2) Out of all the science subjects, I like biology the most.

3) I like biology practicals more than practicals in physics & chemistry

4) I find biology a very difficult subject because it contains too much of technica words

5) The biology practicals clarifies many abtsract concepts.

6) New discoveries in biology stimulate my thinking when I come to know of them.

7) My Achievement in biology is generally first class

8) I study biology because my parents insist on it.

9) While learning biology, I find that time is generally wasted

LABORATORY WORK.

10) I prefer to do my biology practicals individually.

11) In case of any difficult practicals I prefer do in a group of two than to do it independently.

12) I find that biology is a difficult subject

13) It is easy to guess experimental results in biology

14) I wish to know reasons from the teachers when I fail to perform the experiment successfuly

15) I feel overjoyed when I discover, that my problem has been successfully experimented.

16) Our biology laboratory is poorly equipped

17) Our biology teacher puts too many questions in the class

18) I can learn biology effectively even without performing experiments in the laboratory.

19) Our biology teacher demonstrates difficult concepts in the class.

BIOLOGY SYLLABUS

20) Out of all science subjects biology is the least difficult subject to learn.

21) I would like to learn biology in Hindi.

22) I would like to learn biology in English.

23) It is very easy to score very high marks in biology.

24) I would like to specialize in Biology.

25) I wish the school should have more biology periods than other science subjects.

APPENDIX C

| S.No. | Names of the Schools | No.of teachers responded |
|---|---|---|
| 1. | Kamla Nehru Girls Higher Secondary School, Bhopal | 2 |
| 2. | Mahatma Gandhi H.S.School,HEL Bhopal | 2 |
| 3. | St. Joseph Convent School, Bhopal | 1 |
| 4. | Govt.H.S.School, Pipalkhedi | 1 |
| 5. | Demonstration M.H.S. School(RCE)Bhopal | 1 |
| 6. | Deokinandan Girls H.S. School, Bilaspur | 1 |
| 7. | LD S. Higher Secondary School, Lashkar, Gwalior | 1 |
| 8. | Maharanai Laxmibai Girls H.S.School, Bilaspur | 1 |
| 9. | Govt. Multipurpose H.S.School,Bilaspur | 1 |
| 10. | Cambridge School,Bhopal | 1 |
| 11. | Central School, Bhopal | 1 |
| 12. | H.B. Higher Secondary School(Girls), Ratlam | 1 |
| 13. | Govt.Multipurpose H.S.School, Ratlam | 1 |
| 14. | Govt. " " , No.1, Ratlam | 1 |
| 15. | Chhatisgarh H.S. School, Bilaspur | 1 |
| 16. | Jehangiria Higher Secondary School, Bhopal | 1 |
| 17. | M.H.S. School, No.1, Ujjain | 1 |
| 18. | M.H.S. School No. 2, Ujjain | 1 |
| 19. | St Raphaels H.S. School, Indore | 1 |
| 20. | Govt. Multipurpose Hr. Sec. School,Indore | 1 |
| 21. | K.M.M.S.School, Ujjain | 1 |
| 22. | Islamia, Karimia Higher Secondary School,Indore | 1 |

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